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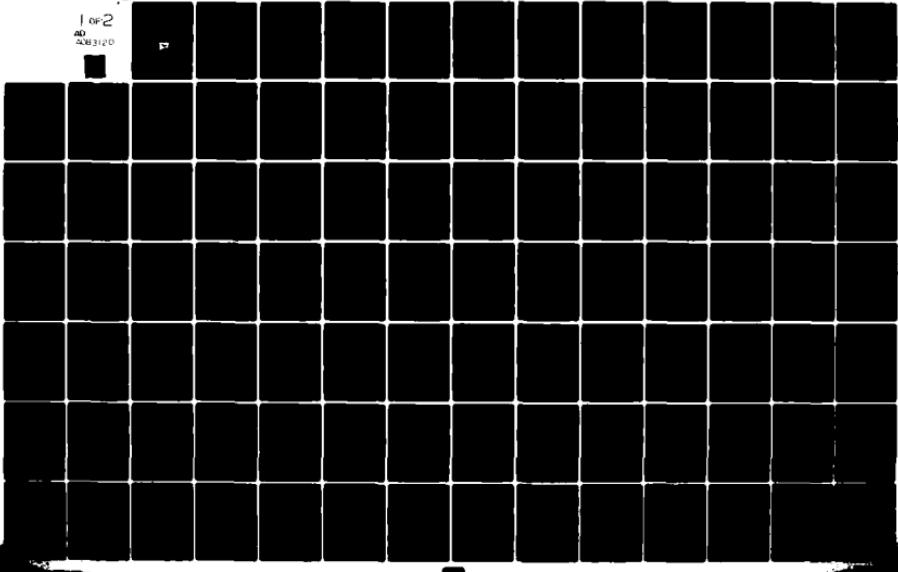
AIR FORCE AVIONICS LAB WRIGHT-PATTERSON AFB OH  
COMPUTER PROGRAM DEVELOPMENT SPECIFICATION FOR IDAMST OPERATION--ETC(U)  
JUL 76

UNCLASSIFIED AFAL-TR-76-209-ADD-4

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1 of 2  
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AFAL-TR-76-209

ADDENDUM #4

LEVEL III

1047650  
1045596

SPECIFICATION NUMBER SD 2043  
CODE IDENT  
PART 1 OF TWO PARTS  
(DATE) 30 JULY 1976

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COMPUTER PROGRAM DEVELOPMENT SPECIFICATION  
FOR  
IDAMST OPERATIONAL TEST PROGRAM

SOFTWARE

TYPE B5

Addendum 4.

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## 1.0 SCOPE

### 1.1 Identification

→ This specification establishes the requirements for the Operational Test Program function of the IDAMST System. The Operational Test Program consists of two primary programs, referred to as Ground Test Program No. 1 (GTP-1) and Ground Test Program No. 2 (GTP-2).

### 1.2 Functional Summary

→ The paragraphs below describe the IDAMST specifications for the Operational Test Programs. These computer programs will be executed in the IDAMST avionics processors in order to determine the operational readiness of the IDAMST core elements and avionics subsystems, to display the equipment status to the ground operator and to initialize tables which describe equipment status. ←

## 2.0 APPLICABLE DOCUMENTS

The following documents of the exact issue shown form a part of this specification to the extent specified herein. In the event of conflict between the documents referenced herein and the contents of this specification, the contents of this specification shall be considered a superseding requirement.

### Specifications:

- 1) Computer Program Development Specification for IDAMST Operational Flight Program Executive Software - Type B5, 30 July 1976

### Other Publications:

- 1) Appendix G to Statement of Work for Purchase Request FV 11757600271 LTP Function Requirement Specification.
- 2) Specifications for IDAMST Software Final Technical Report - MDC Report J7271 - 30 July 1976

### 3.0 REQUIREMENTS

The program GTP-1 will interface with the IDAMST core elements: processors, Bus Control Interface Units (BCIU's), Multiplex Bux (MUX), Remote Terminals (RT's), controls and displays and mass memory.

The function of GTP-1 is to test the performance of these core elements, detect any malfunctions, isolate the fault to the lowest LRU level, and display the test results on the cockpit displays to the maintenance crew.

Similarly, the function of the GTP-2 is to test the performance of the IDAMST Avionics Subsystems Suite, detect any malfunctions, isolate the fault to the lowest LRU level and display the test results on the cockpit displays to the maintenance crew.

Technician interaction for manipulating controls and verifying display presentations will be required to perform these tasks.

#### 3.1 Computer Program Definition

The programs GTP-1 and GTP-2 will be stored on magnetic tape and read into the processor memories. These programs will be read sequentially into the processor memories and executed whenever failures are suspected in the system or when a complete test is desired in preparation of the aircraft for a mission.

After the system has been energized, the ROM Start-Up Program is responsible for process initialization and selection of the master and monitor processors. The Master Executive Program is then loaded into the Master Processor. The Master Processor will proceed with the loading of the processors, initialize the system and initiate normal system operation. If one of the test programs is requested, the Master Executive Program will cause that Program to be read from magnetic tape into the Master Processor and initiate its execution by invoking the Test Master Sequencer.

The loading of a test program will be initiated by means of the Processor Control Panel which will contain a switch allowing the operator to choose between the Application Program, GTP-1 and GTP-2.

When a test program has been loaded, a message requesting the operator to choose a test sequence will appear on MPD-1 and a checklist will be displayed on the IMK. During the course of the testing, instructions and status messages will be displayed on the PMD-1.

The operator will indicate that he wishes either the normal sequence of tests or specific tests by depressing a switch on the IMK. If specific tests are requested, the DEK will be activated and the operator will write in the code for the first test desired.

As each test is finished, a test complete message will appear on the MPD-1. If further tests are desired, the operator will indicate successive tests by using the DEK to write the test code.

When an LRU is determined to be faulty, this information will be displayed to the ground crew. The test programs will also store all indications of faulty LRU's in a status matrix. This matrix will be displayed to the ground crew on the completion of any test sequence.

The GTP-1 and GTP-2 software will also manage display messages requesting ground crew cooperation in operating controls and in verifying responses.

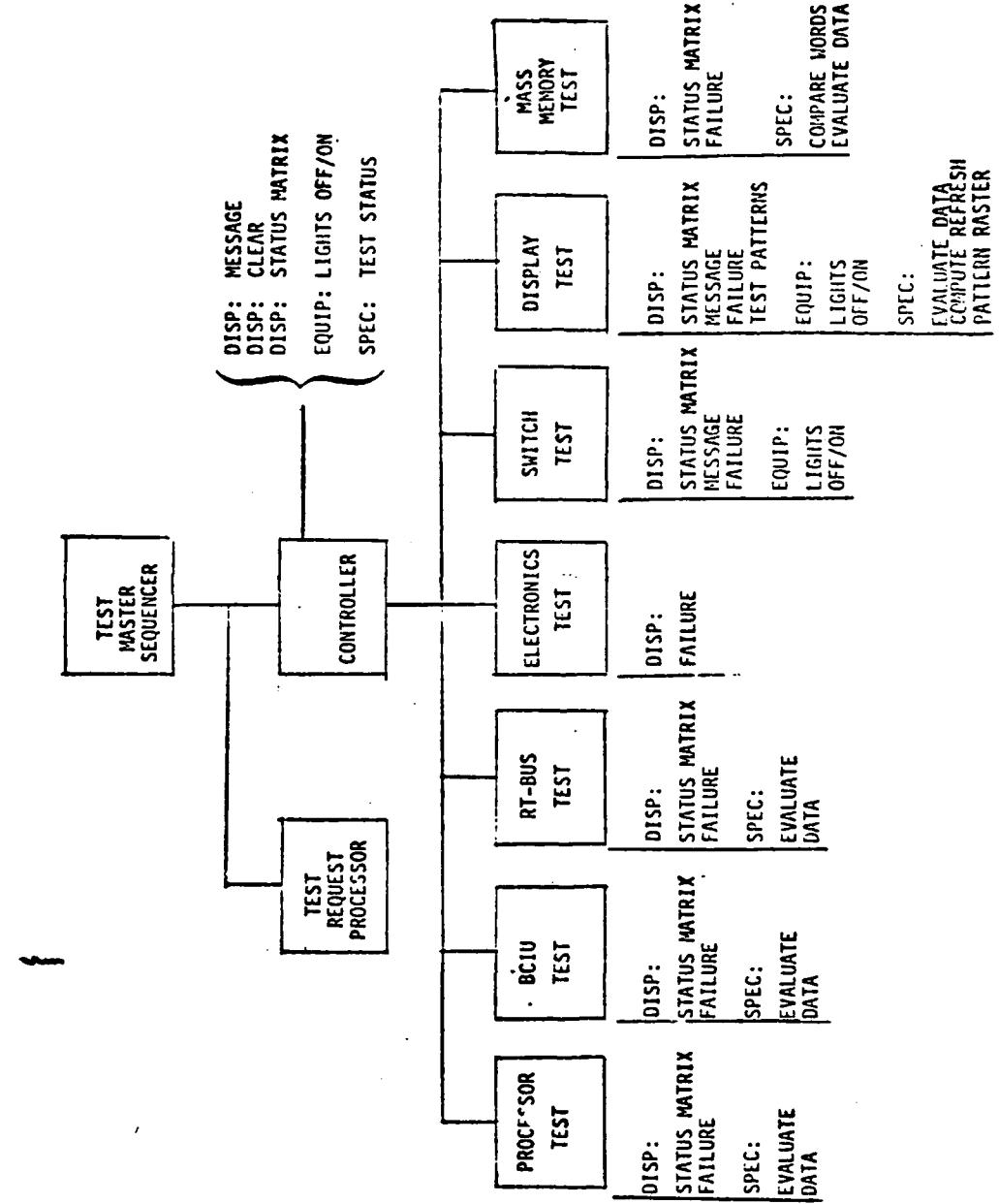
### 3.2 Detailed Functional Requirements

#### 3.2.1 GTP-1 Program

The GTP-1 Software will consist of three System Control Modules, seven first level testing tasks and SPECs, DISPs and EQUIPs as shown in Figure 1.

Test System Control Modules include the Test Master Sequencer, Test Request Processor and Test Controller. These top level controllers on a hierarchical control tree are responsible for initializing and controlling the test tasks. The Test Master Sequencer initializes the compools and schedules the other two system control modules.

When the ground crew operator requests a test or a series of tests, the particular EQUIP servicing the controls and displays will set the Test Request Processor event causing the Test Request Processor module to be activated. The Test Request Processor determines whether a test request is acceptable



## Figure 1 GTP-1 Overview

at this stage of the processing. A request is not acceptable if it will interfere with the test in progress.

If the request is acceptable, the Test Request Processor activates the Test Controller for processing the request. The Test Controller initially schedules all lower level tasks. It activates each testing task either in its normal sequence or when specifically requested by the operator.

The normal test sequence is as follows:

- 1) Processor Test Task to Test Master Processor
- 2) BCIU Test Task to Test Master BCIU
- 3) RT-Bus Test Task to test all RTs and Buses
- 4) BCIU Test Task to test other BCIUs
- 5) Processor Test Task to test all other Processors
- 6) Electronics Test Task to test display electronics (MPDGs, DSMU, MDSC and Displays)
- 7) Switch Test Task to test all display switches
- 8) Display Test Task to test MPDGs and bus, refresh memories, displays and switching matrix
- 9) Mass Memory Test Task to test Mass Memory

Failure information will be displayed on MPD either as a message or in the status matrix. The status matrix will indicate the "go/no-go" status of the following:

- 3 Processors
- 6 (3 redundant) BCIUs
- 12 (6 redundant) RTs
- 2 Buses
- 2 MPDGs
- Bus between MPDGs
- DSMU
- Switching Matrix

5 Refresh Memories  
3 MPDs  
2 HUDs  
2 HSDs  
2 DEKs  
2 IMFKs  
Mass Memory

Built-in Test Equipment (BITE) will be used in testing processors, BCIUs, RTs and Control/Display Electronics. In many cases, this equipment will indicate only an overall go/no-go status. However, the electronics equipment has a Fault Isolation Test (FIT) capability and the other components have self-test software supplied by the manufacturer. These capabilities will be used to indicate failures of lower level components.

### 3.2.1.1 Test Master Sequencer

The Test Master Sequencer is the highest level system control in the GTP-1 software. It is initiated by the Master Executive module after start-up is completed. It processes the data initialization and schedules the Test Request Processor and the Test Controller.

Computer requirements for the module are:

Memory Size	<u>10</u>	16 bit words
Throughput	<u>54</u>	ms/sec
Update Rate	<u>N/A</u>	times/sec

#### 3.2.1.1.1 Inputs

There are no inputs to the Test Master Sequencer.

#### 3.2.1.1.2 Processing

The Test Master Sequencer processing is shown in Figure 2. Upon initial startup of the GTP-1 as commanded by the Executive Program, the Test Master Sequencer schedules the Test Request Processor and the Test

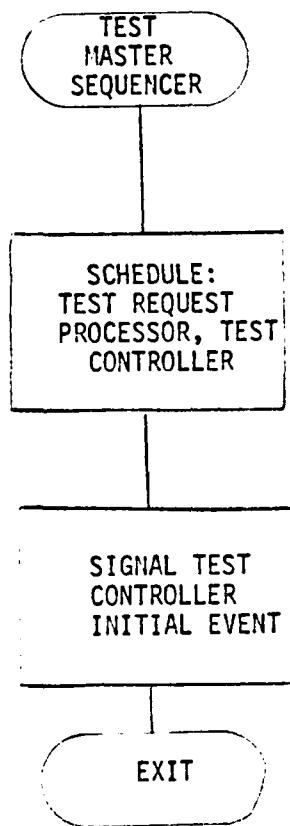


Figure 2      Test Master Sequencer

Controller. The Test Controller Initialization Event is turned on so that the Test Controller can initialize compools.

### 3.2.1.1.3 Outputs

The outputs from the Test Master Sequencer shall be as shown in Table I.

### 3.2.1.2 Test Request Processor

The Test Request Processor interprets inputs from the display indicators. It determines whether an input from the DMK is a test response or a request to change the test sequence. In the latter case, it signals the Test Controller to process the request.

Computer requirements for the module are:

Memory Size	<u>44</u>	16 bit words
Throughput	<u>276</u>	ms/sec
Update Rate	<u>N/A</u>	times/sec

### 3.2.1.2.1 Inputs

The inputs to the Test Request Processor shall be as specified in Table II.

### 3.2.1.2.2 Processing

The Test Request Processor shall perform the processing specified in Figure 3.

The Test Request Processor determines from Test Controller flags which test is in progress. If a DMK indicator is to be processed either the Switch Test Task or the Controls Test Task is signalled to continue processing if either was in progress. Otherwise, the Test Controller is signalled to process a test series change. If the indicator was not on the DEK, then either the Display Test Task is signalled to continue processing or, the Switch Test Task is signalled to continue.

TABLE I      OUTPUTS FROM TEST MASTER SEQUENCER

DATA NAME	SYMBOL	DESTINATION	REFERENCE
Controller Initialization Event		Controller	

TABLE II      INPUTS TO TEST REQUEST PROCESSOR

DATA NAME	SYMBOL	SOURCE	REFERENCE
Display Indicators		EQUIP	

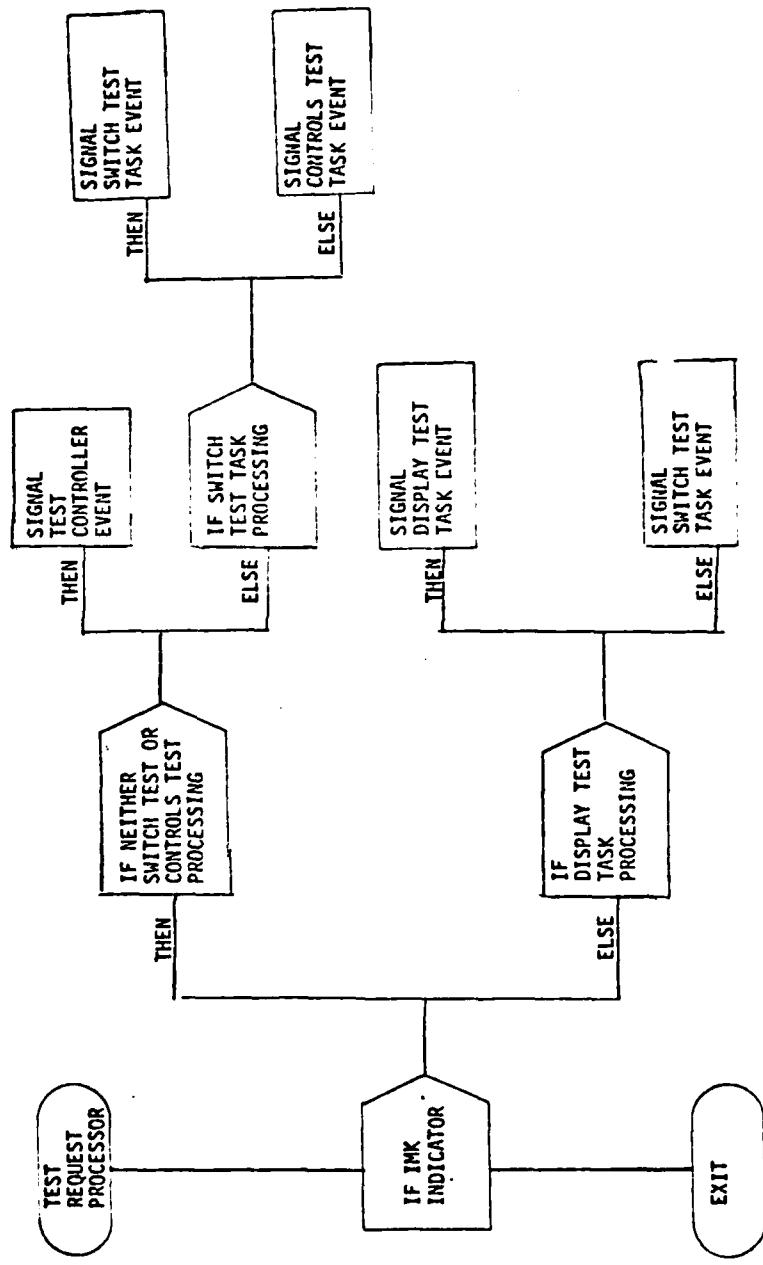


Figure 3 Test Request Processor

### 3.2.1.2.3 Outputs

The outputs from the Test Request Processor shall be as specified in Table III.

### 3.2.1.3 Test Controller (GTP-1)

The Test Controller is activated to initiate testing, when there is a request for a change in test sequence and after each test is completed. It controls the scheduling of tests. The normal sequence is:

Master Processor  
Master BCIU  
RT & MUX (A11)  
Other BCIU's  
Other processors  
Electronic Controls (MPDG's, DSMU, MDSC and displays)  
Switches  
Displays (MPDG, displays; refresh memory, bus, switching matrix)  
Mass Memory

Computer requirements for the module are:

Memory Size	137	16 bit words
Throughput	499	ms/sec
Update Rate	N/A	times/sec

### 3.2.1.3.1 Inputs

The inputs to the Test Controller shall be as specified in Table IV.

### 3.2.1.3.2 Processing

The Test Controller shall perform the processing specified in Figure 4. Data initialization at startup is signalled by the Startup Flag set in the Test Master Sequencer. This data initialization is performed by setting the initialization flags in all the modules requiring initialization and scheduling these modules. Also, all the EQUIP's and DISP's are scheduled.

TABLE IIII      OUTPUTS FROM TEST REQUEST PROCESSOR

DATA NAME	SYMBOL	DESTINATION	REFERENCE
Test Sequence Indicator		Test Controller	
Switch Test Task Event		Switch Test Task	
Display Test Task Event		Display Test Task	
Controls Test Task Event		Controls Test Task	

TABLE IV INPUTS TO THE TEST CONTROLLER

DATA NAME	SYMBOL	SOURCE	REFERENCE
Controller Initialization Event		Master Sequencer	
Test Sequencer Indicator		Request Processor	
Task Completion Event		All Test Tasks	
Test Status		Data Base	

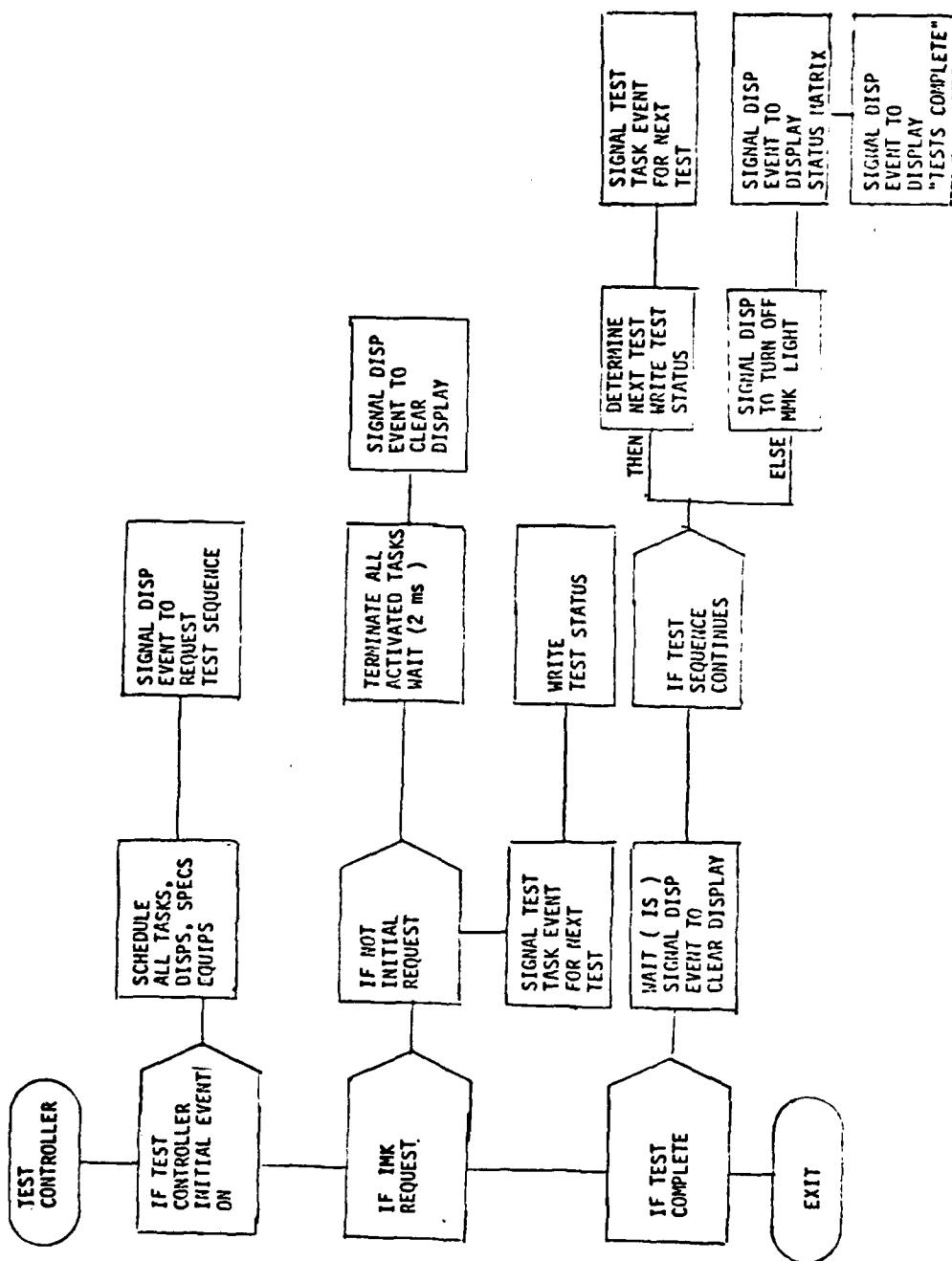


Figure 4 Test Controller

The Test Controller signals a DISP event requesting the ground crew to choose a test sequence.

The initiation of a test sequence or a change in one is signalled by the Test Request Processor. Changes in the test sequence can occur anytime except during the processing of the Switch Test Task or the Controls Test Task. If the request is for a change, all tasks are terminated and the displays are cleared. To start the new sequence, the Test Controller signals the appropriate task. Test status data includes the test sequence and the task being processed.

When a test is completed, the Test Controller waits until the ground crew has read the status matrix and then clears the display. If there are more tests in the sequence, the Test Controller determines from the test status the next test and signals the appropriate task. If the test sequence is completed, the Test Controller signals the displays to turn off the IMK light, to display the status matrix and to display a "tests complete" statement.

#### 3.2.1.3.3 Outputs

The outputs from the Test Controller shall be as specified in Table V.

#### 3.2.1.4 Processor Test Task

The Processor Test Task is activated twice during the normal test sequence. It is first activated to test the Master Processor and Master Processor Memory and later to test all other processors and processor memories.

Computer requirements for the module are:

Memory Size	<u>67</u>	16 bit words
Throughput	<u>436</u>	ms/sec
Update Rate	<u>N/A</u>	times/sec

TABLE V      OUTPUTS FROM TEST CONTROLLER

DATA NAME	SYMBOL	DESTINATION	REFERENCE
Task Initialization Event		All Tasks	
Request Test Sequence	DISP	Tasks as required	
Termination	DISP		
Clear Display		All test tasks	
Signal Task		Data Base	
Test Status		EQUIP	
DEK Indicator	DISP		
Status Matrix	DISP		
Tests Complete	DISP		

#### 3.2.1.4.1 Inputs

The inputs to the Processor Test Task shall be as specified in Table VI.

#### 3.2.1.4.2 Processing

The Processor Test Task shall perform the processing as specified in Figure 5.

It is first determined whether the task was enabled to test only the Master Processor. Otherwise, the software must test all the other processors.

The BIT (Built-In Test) data will be checked. This is done by invoking the executive task that requests this data. BIT data will include such information as:

- Computer clock malfunction
- Overtemp condition
- Arithmetic overflow
- Attempted memory protect violation
- Power interrupt
- Memory parity error

If there is not a response on the specified time, this will be displayed for the operator by signalling a DISP event. Otherwise the BIT data is stored for evaluation.

A series of self-tests will complete the processor testing. It is assumed that the software for these tests will be supplied with the hardware. These tests will include such information as:

- Arithmetic self-test
- Memory read/write and memory addressing test
- Processor/BCIU program control I/O and DMA I/O test
- Interrupt tests
- Read/write from each general register

TABLE VI      INPUTS TO PROCESSOR TEST TASK

DATA NAME	SYMBOL	SOURCE	REFERENCE
SELF-TEST RESULTS		PROCESSOR	
BIT DATA		PROCESSOR	
PROCESSOR NUMBERS		GTP-1 CONTROL TASK	

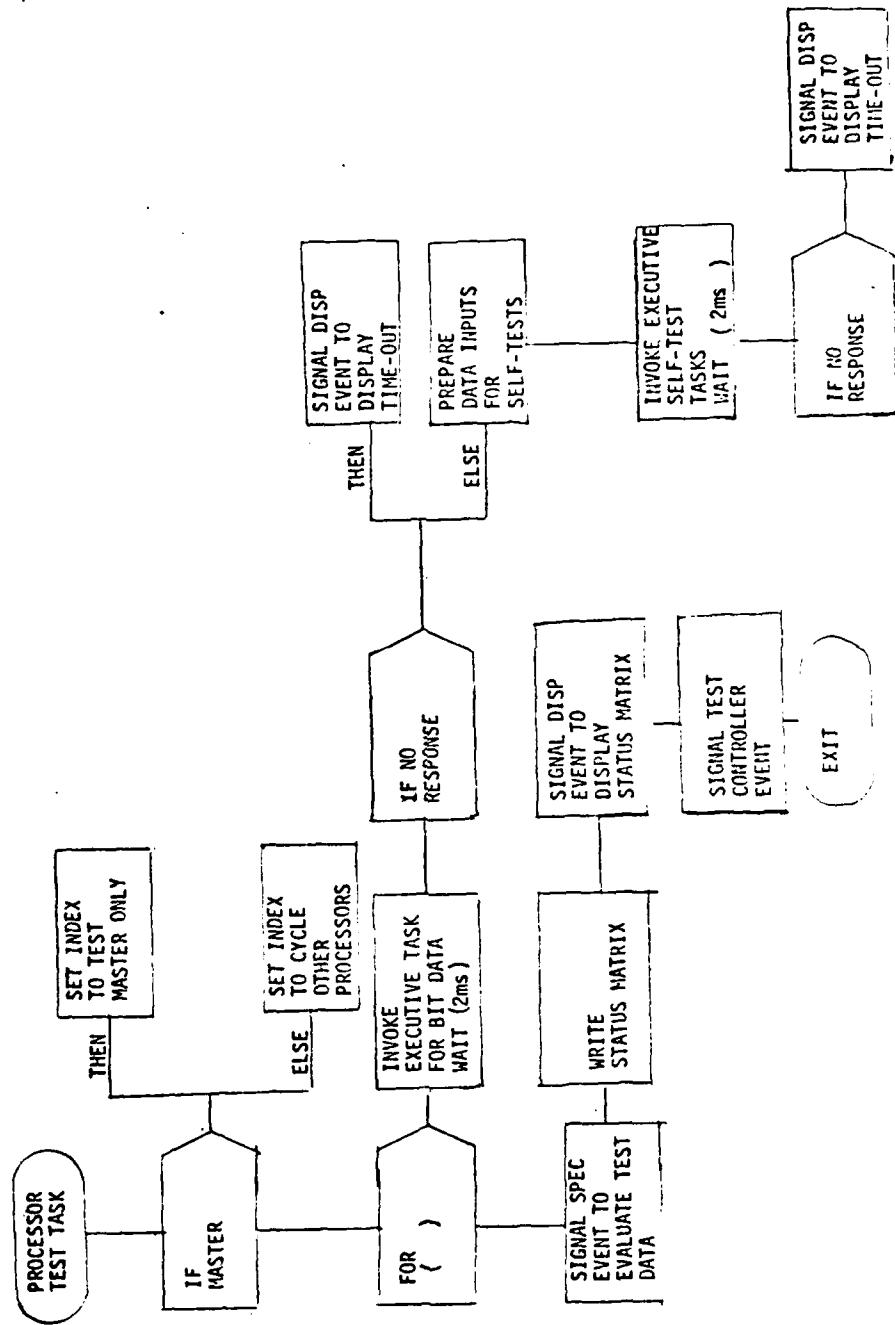


Figure 5 Processor Test Task

If a response is not received in the specified time, a DISP event will be signalled to display the time-out for the operator.

After all processors have been tested, a SPEC event will be signalled to evaluate the data. The status of each processor will be stored in the status matrix. The matrix will be displayed for the operator.

The task then signals the Test Controller that the test has been completed.

The path used in testing the processors other than the Master Processor will be one previously determined to be operational. In the normal test sequence these processors will be tested after the BCIUs, RTs, and buses.

#### 3.2.1.4.3 Outputs

The outputs from the Processor Test Task shall be as specified in Table VII.

#### 3.2.1.5 BCIU Test Task

The BCIU Test Task is activated twice during the normal test sequence. On its first activation it will test the Master BCIU. After the RT-Bus Test Task, it will again be activated, this time to test all non-Master BCIUs. In testing these non-Master BCIUs, a path that has been determined to be operational will be used.

Computer requirements for the module are:

Memory Size	<u>73</u>	16 bit words
Throughput	<u>436</u>	ms/sec
Update Rate	<u>N/A</u>	times/sec

#### 3.2.1.5.1 Inputs

The inputs to the BCIU Test Task shall be as specified in Table VIII.

TABLE VII      OUTPUTS FROM PROCESSOR TEST TASK

DATA NAME	SYMBOL	DESTINATION	REFERENCE
PROCESSOR NUMBER		MPD BY DISPLAY TASK	
TIME-OUTS		MPD BY DISPLAY TASK	
TEST RESULTS		MPD BY DISPLAY TASK	
TEST RESULTS		STATUS MATRIX (DATA BASE)	
INVOKED STATEMENT		EXECUTIVE TASK	
TEST COMPLETE EVENT		TEST CONTROLLER	

TABLE VIII      INPUTS TO BCIU TEST TASK

DATA NAME	SYMBOL	SOURCE	REFERENCE
BCIU NUMBER		TEST CONTROLLER	
BIT DATA		BCIU	
SELF-TEST RESULTS		BCIU	

### 3.2.1.5.2 Processing

The BCIU Test Task shall perform the processing specified in Figure 6.

It is first determined whether the Master BCIU or all other BCIUs is being tested. In the latter case one BCIU will be tested at a time.

The executive task uses the Mode Message to obtain both BIT and self-test data. The BCIU Test Task will first request the executive to obtain BIT data. If a response is not received in the specified time, a time-out error will be displayed for the operator. This will be done by signalling a DISP event.

If the data is received it is stored for evaluation. The data will include:

Message Error checks for both transmitter and receiver, no data received, incomplete data, data parity error, or invalid command

Power interrupt condition occurred

DMA Error Condition

Invalid Instruction

The Mode Message is used to request the BCIUs to perform self-tests. For GTP-1, these tests should be complete. That is, every control path, every instruction, every register, etc., should be tested not some subset of each. The self-test software should be prepared along with the hardware and will include tests such as:

Data flow tests

Loading/reading internal registers

Sequence and control tests

Internal bi-directional bus tests

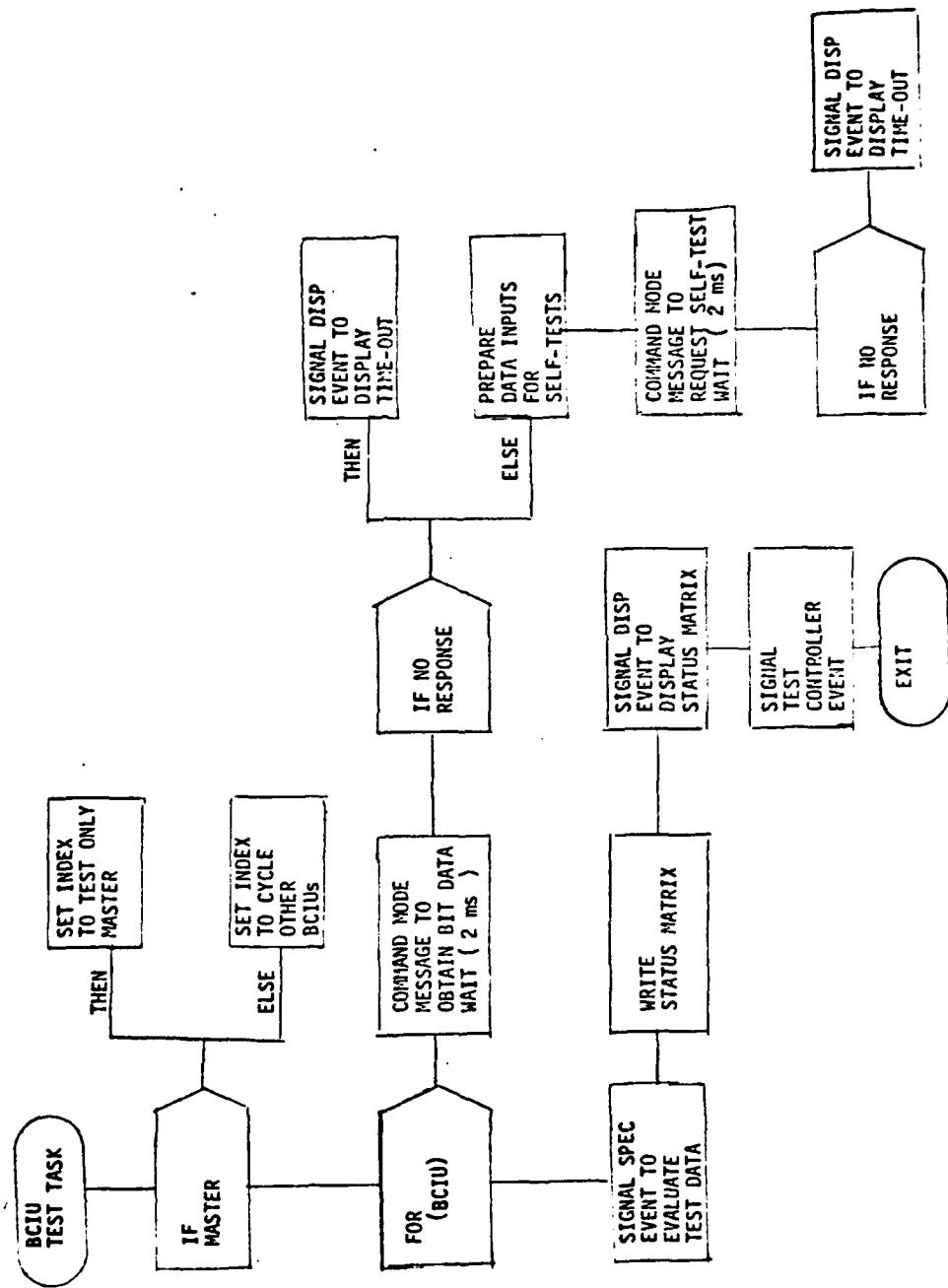


Figure 6 BCIU Test Task

Closed loop or wrap around test of bus channels  
DMA data flow and PI/O operation checks

If a response is not received in the specified time, the time-out error will be displayed for the operator.

After every BCIU has been tested, the data will be evaluated by signalling a SPEC event. If any half of a BCIU has an error, that half will be declared a failure. However, if every BCIU on a bus appears to be a failure, then the bus, not the BCIUs, will be declared a failure.

The results of the evaluation will be written in the status matrix which will be displayed for the operator.

The task will then signal a Test Controller event that the tests have been completed.

#### 3.2.1.5.3 Outputs

The outputs from the BCIU Test Task shall be as specified in Table IX.

#### 3.2.1.6 RT-Bus Test Task

The RT-Bus Test Task is activated during the normal test sequence or when the RT-Bus tests are specifically requested by the ground crew.

Computer requirements for the module are:

Memory Size	<u>80</u>	16 bit words
Throughput	<u>383</u>	ms/sec
Update Rate	<u>N/A</u>	times/sec

#### 3.2.1.6.1 Inputs

The inputs to the RT-Bus Test Task shall be as specified in Table X.

TABLE IX      OUTPUTS FROM BCIU TEST TASK

DATA NAME	SYMBOL	DESTINATION	REFERENCE
BCIU NUMBER		MPD BY DISP	
TIME-OUTS		MPD BY DISP	
TEST RESULTS		MPD BY DISP	
TEST. RESULTS		STATUS MATRIX	
COMMAND MODE MESSAGE		EXECUTIVE TASK	
TEST COMPLETE EVENT		TEST CONTROLLER	

TABLE X      INPUTS TO RT-BUS TEST TASK

DATA NAME	SYMBOL	SOURCE	REFERENCE
RT NUMBER		TEST CONTROLLER	
BIT DATA		RT	
SELF-TEST RESULTS		RT	

### 3.2.1.6.2 Processing

The RT-Bus Test Task shall perform the processing as specified in Figure 7.

The RT-Bus Test Task shall test all of the RTs on one bus. If all RTs fail then the bus, not the RTs, will be declared a failure. The task shall then test all RTs using the other bus.

Each half of an RT will be tested first using BIT data. The BIT data is obtained by sending a Command Mode Message to the Executive Task. The BIT data shall include:

Message error checks, no data received, incomplete data, data parity error or invalid command

Power interrupt condition occurred

Wrap around data check on last word

Parity checks and acknowledgement checks in Interface Module (IM)

If a response is not received in the specified time a time-out error will be displayed for the operator.

A Command Mode Message is sent to the Executive Task requesting that complete self-tests be performed. These tests include:

General RT closed loop or wrap around tests

Data flow tests

Sequence and control tests

Internal bi-directional bus tests

Analog to digital converter calibration checks

Tolerance check on each supply voltage

Interface Module (IM) Tests as follows:

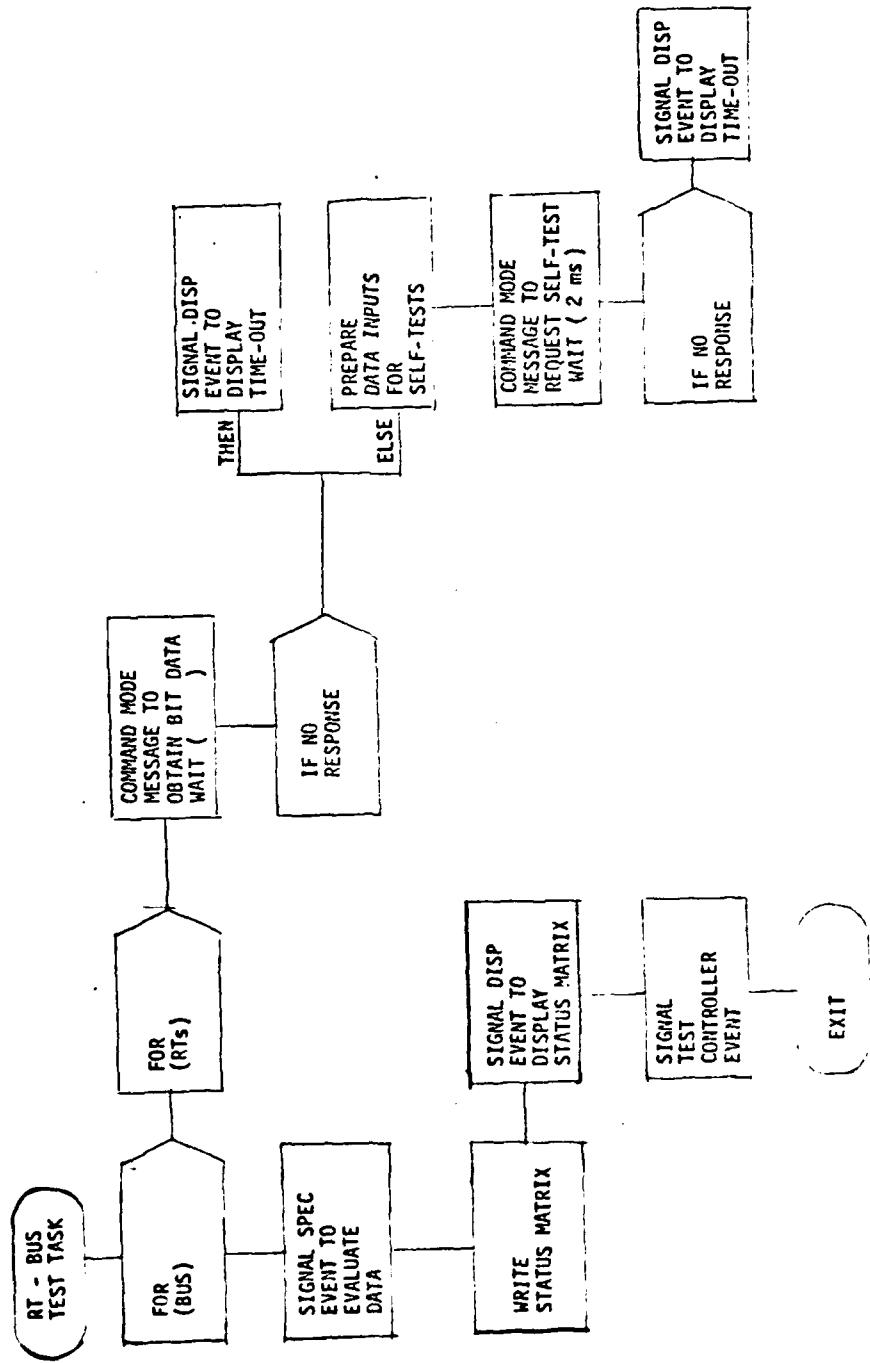


Figure 7 RT Bus Test Task

<u>IM</u>	<u>Check</u>
DC Analog Input	Cal check Each Chennel
Discrete Output	Wrap Feedback Compare
AC Analog Input	Dual Demodulation & Compare
AC & Synchro Analog Output	Selective Demodulation of Each Channel
Synchro Input	Reasonableness Test on $\sin^2 + \cos^2 = \text{Constant}$
Serial & Special I/O	Wrap Compare Input and Output Logic

If a response is not received in the specified time, a time-out error will be displayed for the operator.

When tests have been completed for all RTs and both buses, the data is evaluated. A SPEC event is signaled. This SPEC will determine if a bus has failed, and if not will determine which RTs shall be declared failed. This data is written in the Status Matrix which is displayed for the operator.

The task will signal the Test Controller that the tests have been completed.

#### 3.2.1.6.3 Outputs

The outputs from the RT-Bus Test Task shall be as specified in Table

#### 3.2.1.7 Electronics Test Task

The Electronics Test Task is activated during the normal test sequence or when it is specifically requested by the ground crew. The task tests the electronics of the Control and Display system including two Modular Programmable Display Generators (MPDG), the Display Switch/Memory Unit (DSMU), the Modular Digital Scan Converter (MDSC) and displays.

TABLE X1      OUTPUTS FROM RT-BUS TEST TASK

DATA NAME	SYMBOL	DESTINATION	REFERENCE
RT NUMBER		MPD BY DISP	
TIME OUT'S		MPD BY DISP	
TEST RESULTS		MPD BY DISP	
TEST RESULTS		STATUS MATRIX (DATA BASE)	
COMMAND MODE MESSAGE		EXECUTIVE TASK	
TEST COMPLETE EVENT		TEST CONTROLLER	

Computer requirements for the module are:

Memory Size	<u>47</u>	16 bit words
Throughput	<u>312</u>	ms/sec
Update Rate	<u>N/A</u>	times/sec

### 3.2.1.7.1 Inputs

The inputs to the Electronics Test Task shall be as specified in Table XII.

### 3.2.1.7.2 Processing

The Electronics Test Task shall perform the processing specified in Figure 8.

BIT shall be requested by sending a Command Mode Message to the Executive Task. In this case, BIT is used to determine an overall "go/no-go" status. If a system "go" response is received, that information is displayed for the operator and used to update the status matrix.

If either a "no-go" is received or a response is not received in the specified time, the Fault Isolation Test (FIT) capability is needed. FIT is used on the ground to determine which module has failed. It is requested by use of the Command Mode Message to the Executive Task. If a response is not received in the specified time, a time-out error will be displayed for the operator.

If a response is received, the module failures will be displayed for the operator and the status matrix will be updated.

The task will signal the Test Controller that the tests have been completed.

### 3.2.1.7.3 Outputs

The outputs from the Electronics Test Task shall be as specified in Table XIII.

TABLE XII      INPUTS TO ELECTRONICS TEST TASK

DATA NAME	SYMBOL	SOURCE	REFERENCE
BIT "GO/NO-GO"		MPDG	
FIT		MPDG	

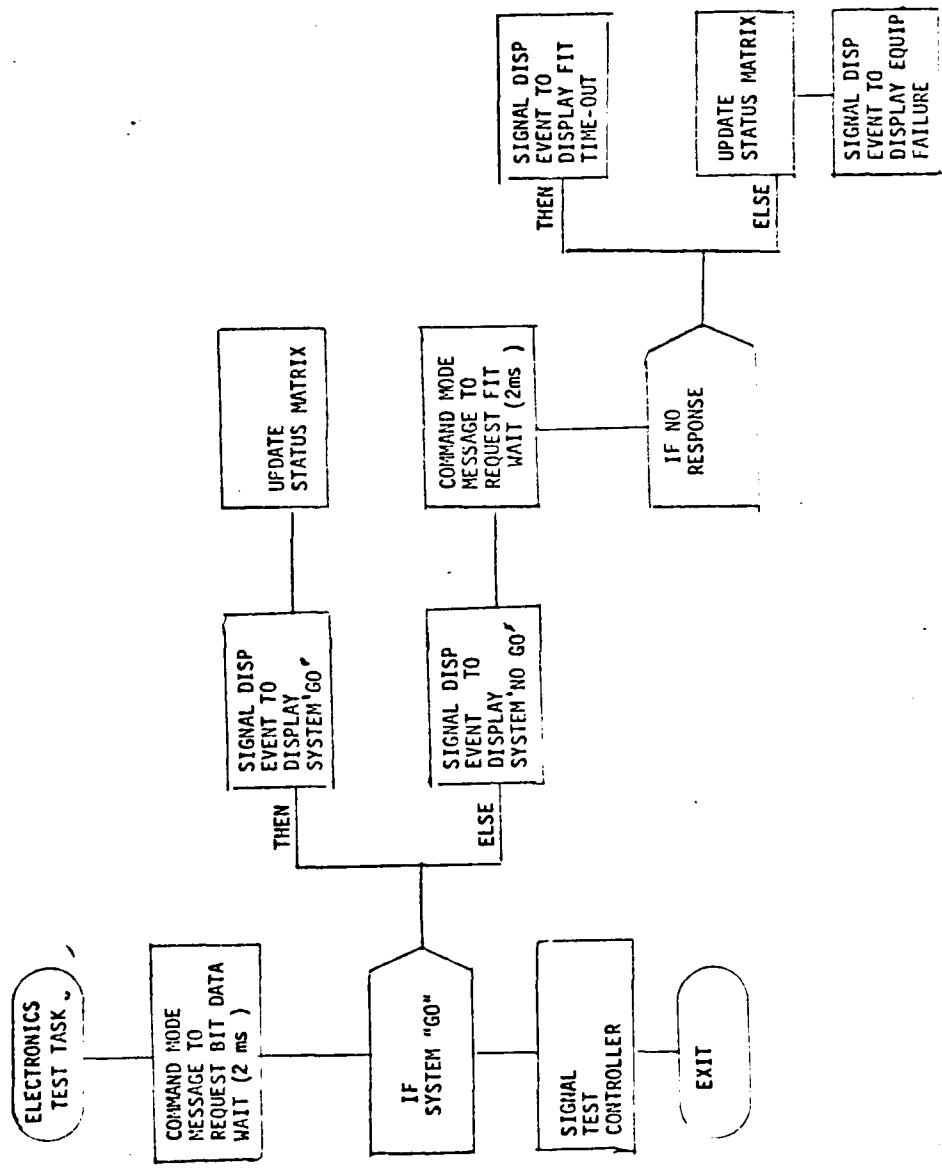


Figure 8      Electronics Test Task

TABLE XIII      OUTPUTS FROM ELECTRONICS TEST TASK

DATA NAME	SYMBOL	DESTINATION	REFERENCE
TIME-OUT		MPD BY DISP	
SYSTEM GO/NO-GO		MPD BY DISP	
FAILED MODULE		MPD BY DISP	
TESTS RESULTS		STATUS MATRIX	
COMMAND MODE MESSAGE		EXECUTIVE TASK	
TEST COMPLETE EVENT		TEST CONTROLLER	

### 3.2.1.8 Switch Test Task

The Switch Test Task is activated during the normal test sequence or when it is specifically requested by the ground crew. The task tests all display light switches.

Computer requirements for the module are:

Memory Size	<u>80</u>	16 bit words
Throughput	<u>472</u>	ms/sec
Update Rate	<u>N/A</u>	times/sec

#### 3.2.1.8.1 Inputs

The inputs to the Switch Test Task shall be as specified in Table XIV.

#### 3.2.1.8.2 Processing

The Switch Test Task shall perform the processing specified in Figure 9.

It is assumed that the ground crew can determine faulty light bulbs by inspection. That is, if no light is turned on before a failure message arrives, the bulb should be replaced and the switch retested.

To avoid confusion, the test sequence can not be changed while this task is processing. The Test Request Processor shall route all switch data to the Switch Test Task rather than the Test Controller.

The task will signal a DISP event to display instructions to the operator. The operator will be requested to depress each switch as it is lighted. These include:

- 15 switches on MMP, light turned from white to green
- 7 top switches on IMK-1, light turned from white to green
- 10 side switches on IMK-1, light turned from white to green
- 7 top switches on IMK-2, light turned from white to green
- 10 side switches on IMK-2, light turned from white to green
- 12 switches on DEK-1, light turned ON (white)

TABLE XIV      INPUTS TO SWITCH TEST TASK

DATA NAME	SYMBOL	SOURCE	REFERENCE
DISPLAY INDICATORS		DISP, EQUIP	

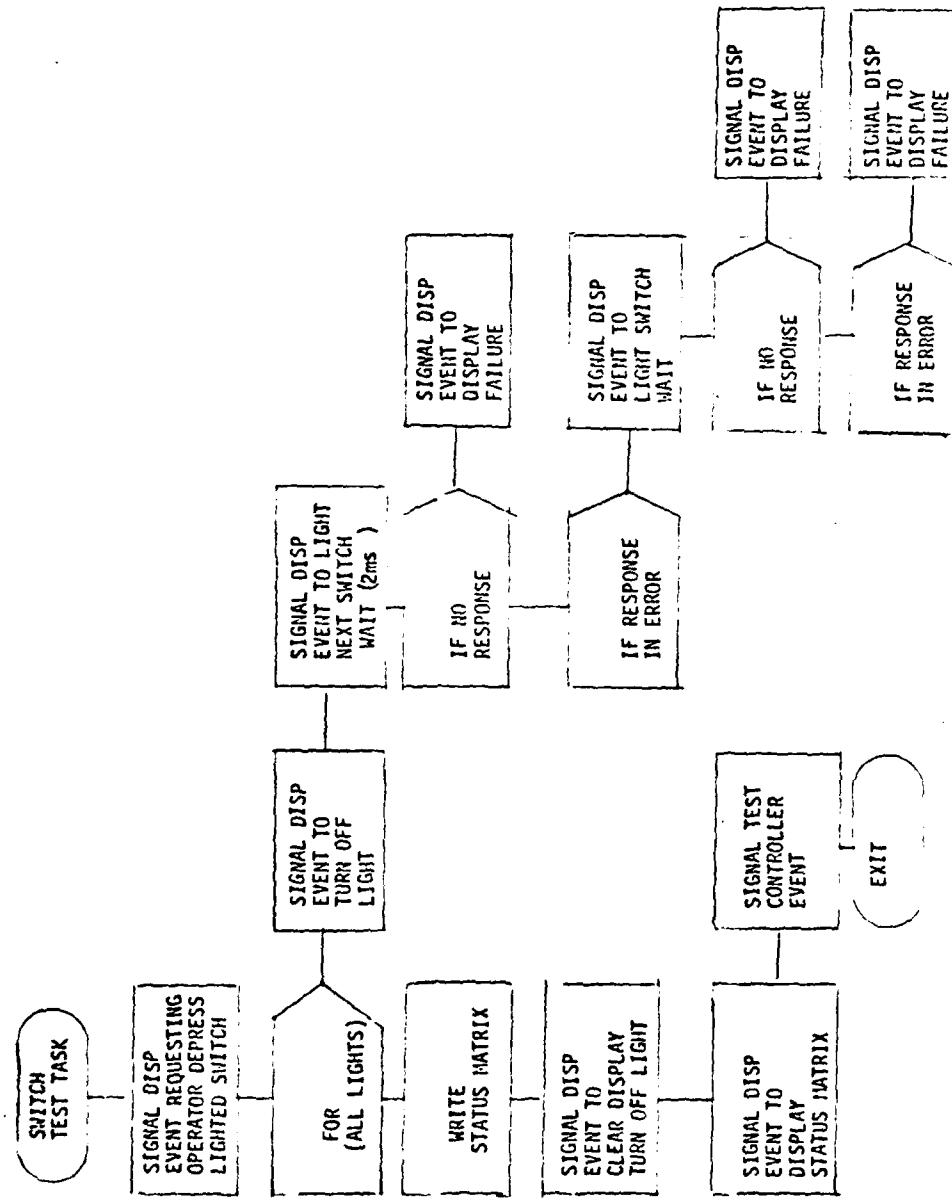


Figure 9 Switch Test Task

12 switches on DEK-2, light turned ON (white)

Each light will be turned on. If a response is not received in the specified time, the switch failed the test and this will be displayed. If the wrong switch was pressed, another test will be performed for that switch. If the switch is still in error, the switch will be declared failed.

The status matrix shall be updated after all switches have been tested. It will be displayed by signalling a DISP event.

The task will signal the Test Controller that the tests have been completed.

#### 3.2.1.8.3 Outputs

The outputs from the Switch Test Task shall be as specified in Table XV.

#### 3.2.1.9 Display Test Task

The Display Test Task is activated during the normal test sequence or when it is specifically requested by the ground crew. This task will test the two MPDGs and bus, the refresh memories, the displays and the switching matrix.

Computer requirements for the module are:

Memory Size	<u>232</u>	16 bit words
Throughput	<u>775</u>	ms/sec
Update Rate	<u>N/A</u>	times/sec

#### 3.2.1.9.1 Inputs

The inputs to the Display Test Task shall be as specified in Table XVI.

TABLE XV      OUTPUTS FROM SWITCH TEST TASK

DATA NAME	SYMBOL	DESTINATION	REFERENCE
FAILURES		MPD BY DISP	
TEST COMPLETE EVENT		TEST CONTROLLER	

TABLE XVI      INPUTS TO DISPLAY TEST TASK

DATA NAME	SYMBOL	SOURCE	REFERENCE
DISPLAY INDICATORS		DISP, EQUIP	

### 3.2.1.9.2 Processing

The Display Test Task shall perform the processing specified in Figure 10.

The ground crew operator shall determine whether a display is operational or a failure. The task will turn on a specific switch every time a new test decision is to be made. Two switches will be used by the operator: one to indicate an operational display, the other, a failure. This test should follow the Switch Test Task so that switches can be assumed in working condition.

The BITE signals for the MPDGs have already been tested. One of the MPDGs will be requested to display a special test pattern on the MPD-1. If, for any reason, the display is a failure, the failure will be displayed for the operator.

If the display is operational, the test pattern will be repeated using different refresh memories to test the refresh memories. The test pattern will then be switched to the other MPDG. The same processing will be done for this MPDG.

The displays (2 HUDs, 2 HSDs, and 3 MPDs) will be tested next. A TV type test pattern will be displayed. It will be rotated and switched from display to display. The operator will indicate which displays are operational.

A SPEC event will be signaled to evaluate the equipment. This SPEC will analyze the failures to determine which equipment is faulty. The Status Matrix will be updated and displayed for the operator.

The task will signal the Test Controller that the tests have been completed.

### 3.2.1.9.3 Outputs

The outputs from the Display Test Task shall be as specified in Table XVII.

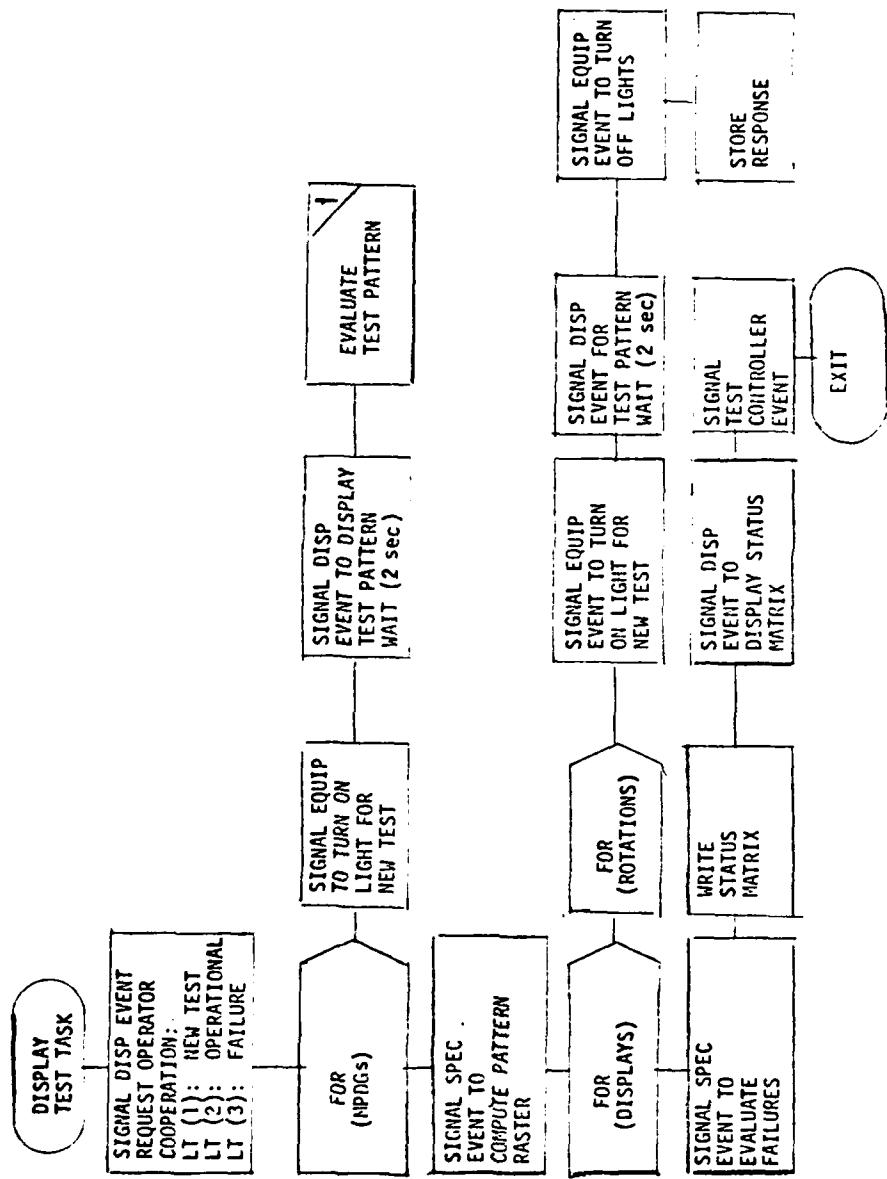


Figure 10 Display Test Task

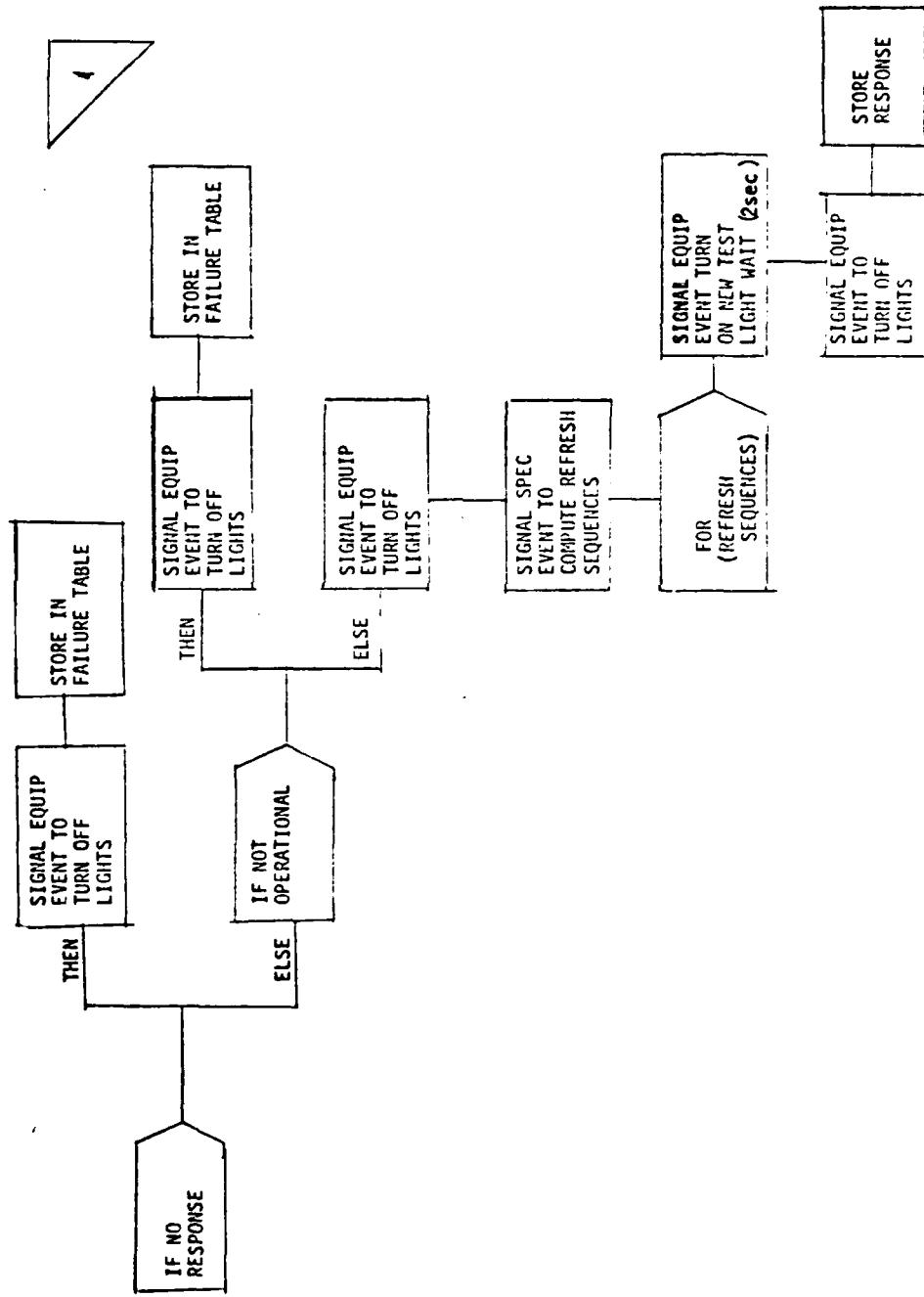


Figure 10 Display Test Task (Cont.)

TABLE XVII      OUTPUTS FROM DISPLAY TEST TASK

DATA NAME	SYMBOL	DESTINATION	REFERENCE
TEST PATTERN (GRID)		MPD	
TEST PATTERN (TV TYPE)		HUDS, MPDS, HSDs	
STATUS MATRIX		DATA BASE	
STATUS MATRIX		MPD	
DISPLAY INDICATORS		EQUIP	
TEST COMPLETE EVENT		TEST CONTROLLER	

### 3.2.1.10 Mass Memory Test Task

The Mass Memory Test Task is activated during the normal test sequence or when a Mass Memory Test is specifically requested from the ground crew.

Computer requirements for the module are:

Memory Size	<u>153</u>	16 bit words
Throughput	<u>632</u>	ms/sec
Update Rate	<u>N/A</u>	times/sec

#### 3.2.1.10.1 Inputs

The inputs to the Mass Memory Test Task shall be as specified in Table XVIII.

#### 3.2.1.10.2 Processing

The Mass Memory Test Task shall perform the processing specified in Figure 11.

The Mass Memory Test Task requests BIT data by sending a Command Mode Message to the Executive Task. The results are evaluated and used to update the status matrix.

The task shall next read the first word of every file in Mass Memory. After signalling an event that it would like to read from Mass Memory, and receiving an acknowledgement from the Master Executive, the task will write in a compool the name of the file and the record numbers it would like to receive. The task will then wait for an event from the Master Executive.

The Master Executive finds the data on the Mass Memory and reads it into a Compool, 32 words at a time. The Master Executive will then signal an event that the data is available. The Mass Memory Test Task will read the data from the Compool and signal that it has been received.

TABLE XVIII      INPUTS TO MASS MEMORY TEST TASK

DATA NAME	SYMBOL	SOURCE	REFERENCE
BIT DATA		MASS MEMORY	
FIRST WORD OF FILE		MASS MEMORY	
TEST WORD		DATA BASE	

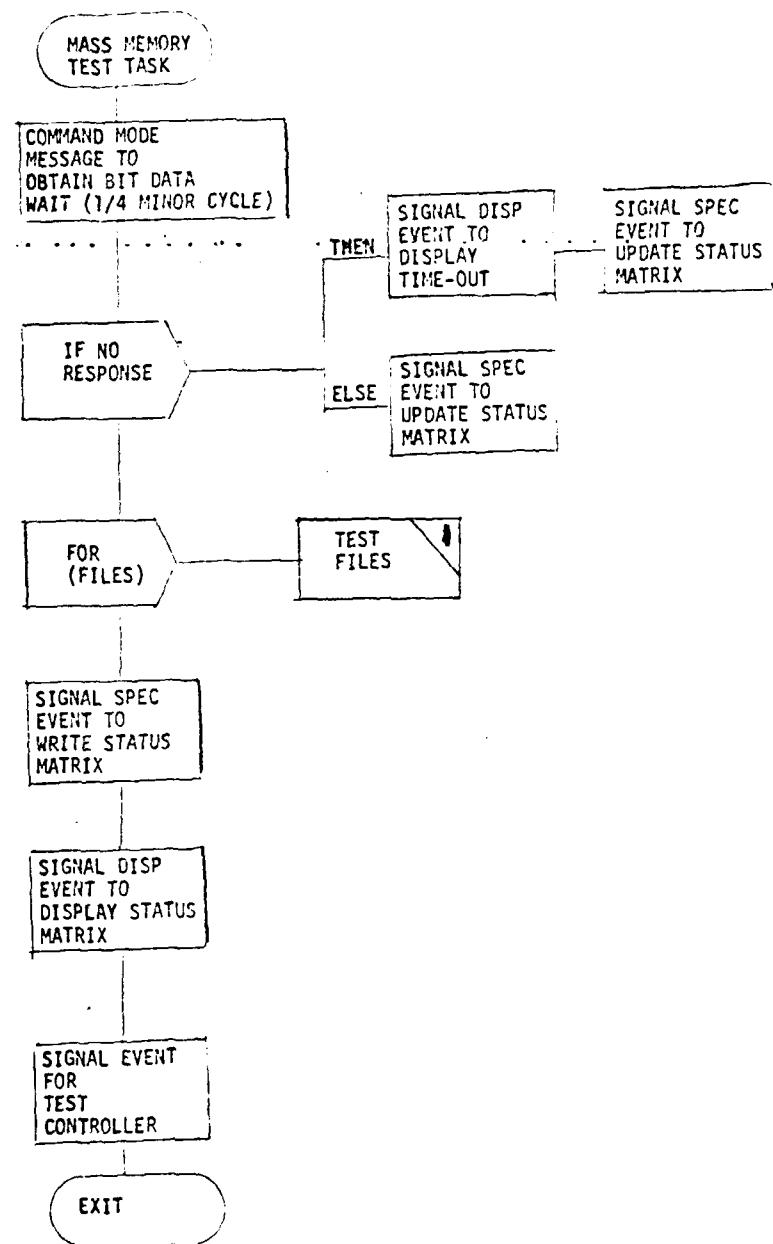


Figure 11 Mass Memory Test Task

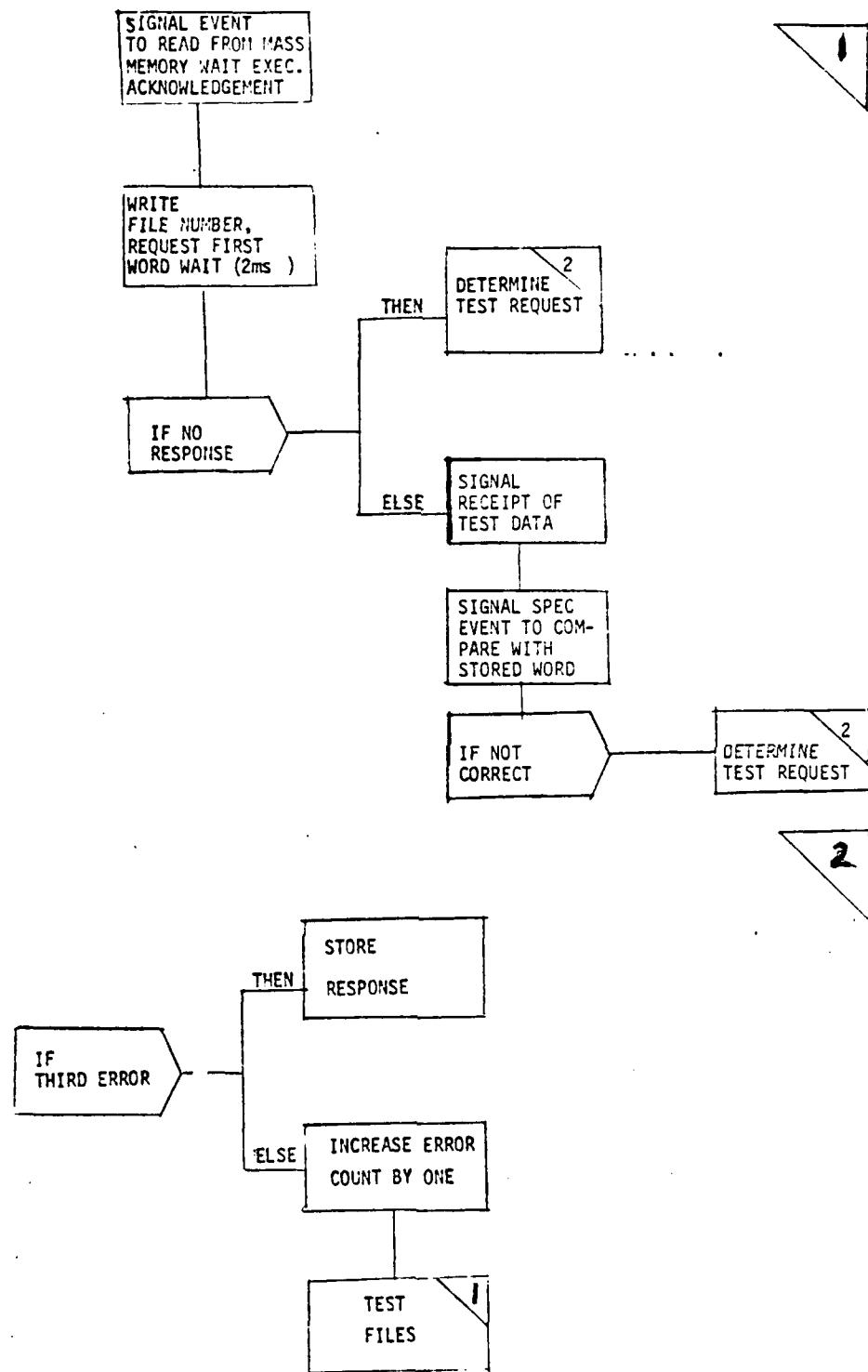


Figure 11 Mass Memory Test Task (Cont.)

The task then signals an event to compare the first word of a file with a stored word. If the word is unacceptable the word will be read again. If it is unacceptable, three successive times, the recorder containing that file will be declared faulty.

When all files have been read and all faults declared, the status matrix will be updated and displayed for the operator.

The task will signal the Test Controller that the tests have been completed.

### 3.2.1.10.3 Outputs

The outputs from the Mass Memory Test Task shall be as specified in Table XIX.

### 3.2.2 GTP-2 Program

The GTP-2 software consists of a set of test modules controlled by the Test Master Sequencer, the Test Request Processor and the Test Controller with the test results catalogued by the Subsystem Status Monitor (see Figure 12 ). The Test Master Sequencer schedules and initializes the other two system control modules.

The Test Request Processor interprets inputs from the IMK. It determines whether the keyboard inputs are test responses or test sequence commands.

The Test Controller is responsible for the scheduling of the tests and for activating the appropriate EQUIPs, DISPs, and SPECs to perform the testing function and to display the results on the MPD.

The EQUIP modules will provide the software interface between the Remote Terminals (RT's) associated with the individual avionics subsystems and the remainder of the GTP-2 software. The EQUIPs will process the inputs from the subsystems to the software and the outputs from the GTP-2 to the avionics. They will also process any BITE data available and will appropriately configure the status word subsequently used by the Subsystem Status Monitor. All the EQUIPs used are the same as those in the OFP and are

TABLE XIX      OUTPUTS FROM MASS MEMORY TEST TASK

DATA NAME	SYMBOL	DESTINATION	REFERENCE
STATUS MATRIX		DISP	
STATUS MATRIX		DATA BASE	
TEST COMPLETE EVENT		TEST CONTROLLER	
COMPARE DATA		SPEC	
READ MASS MEMORY EVENT		MASTER EXECUTIVE	

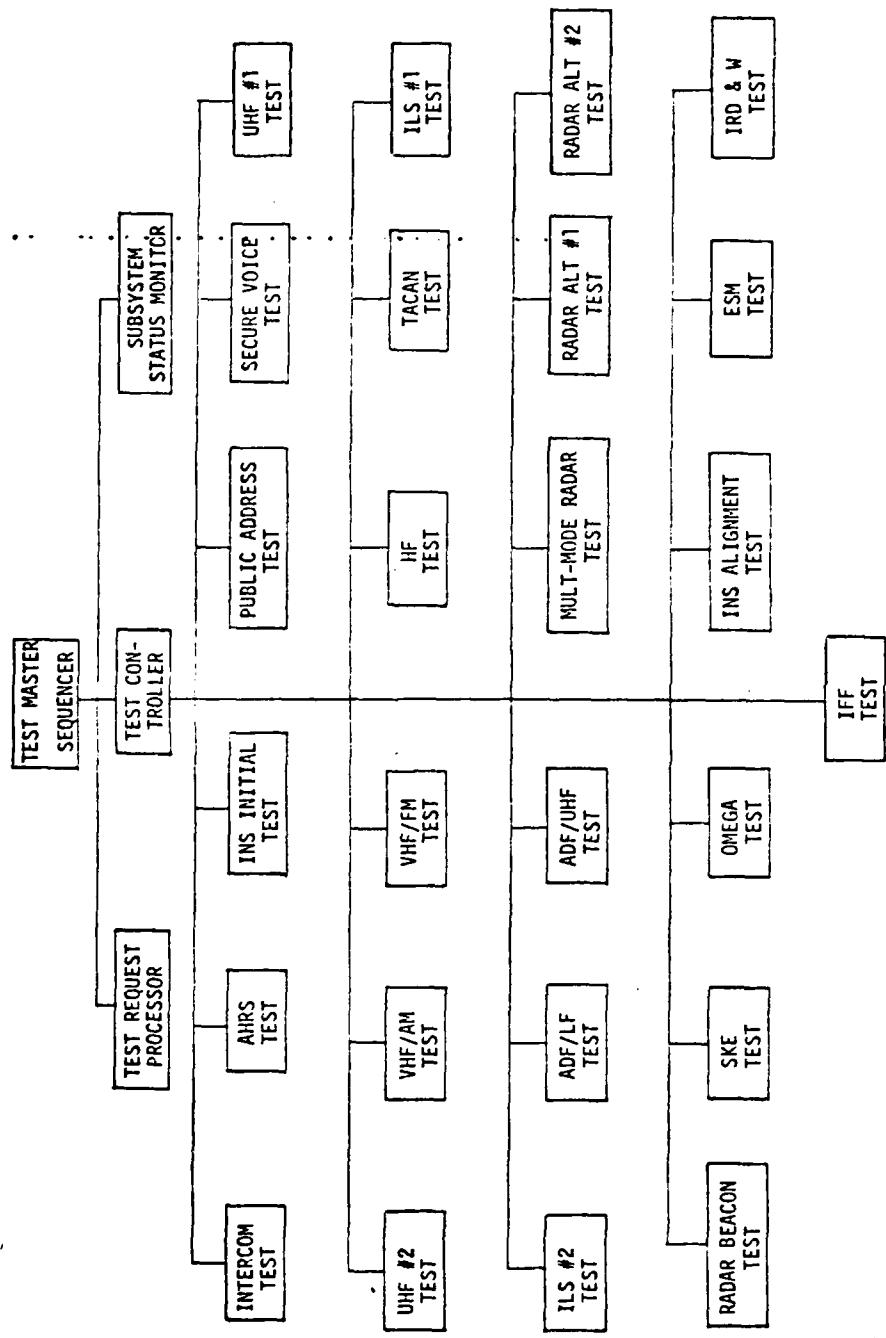


Figure 12 GTP-2 Overview

described in the specification for the OFP-Application Software.

The DISP modules will cause the test results advisory messages, and procedural instructions to be displayed on the MPD or the IMK. The DISP modules to be used are also the same as those in the OFP.

Included in the EQUIP modules are applicable data validity tests in addition to the BITE data processing features. Any additional test procedures deemed necessary will be incorporated in the SPEC modules.

Once the program loading verification and initialization have been completed by the Master Executive, the Test Master Sequencer activates the Test Controller which causes a DISP to display a "Ready-to-Test" message on the MPD. The normal subsystem test sequence is shown in Figure 13.

To execute the entire GTP-2, the operator need merely depress the appropriate pushbutton on the IMK and observe the results of the first test on the MPD. The depression of the IMK pushbutton will cause the Test Request Processor to activate the Test Controller which schedules the appropriate EQUIPs, SPECs, and DISPs to accomplish the first test sequence. The results of the test will be displayed on the MPD for evaluation by the operator, then the Test Controller will advance to the next sequential test awaiting the command from the Test Request Processor to begin execution. The next sequential test may be executed by the operator depressing the IMK pushbutton again. This procedure would be continued until all of the tests have been executed and the pertinent test results, or LRU failure data, if any, have been noted.

To initiate any specific test out of the sequential order, the operator must select individual test option and enter a two-digit test code (see Figure 13 ) into the DEK, then depress the pushbutton on the IMK. This activates the Test Request Processor which then determines whether the test request is acceptable and whether the test will interfere with another test, if any, in process.

This same procedure would allow the operator to repeat a particular test, or to skip a test or group of tests.

<u>TEST CODE</u>	<u>SUBSYSTEM TESTS</u>	<u>TEST CODE</u>	<u>SUBSYSTEM TESTS</u>
10	INTERCOM CHECK	23	ADF/LF CHECK
11	AHRS CHECK	24	ADF/UHF CHECK
12	INS INITIAL CHECK	25	MULTI-MODE RADAR CHECK
13	PUBLIC ADDRESS CHECK	26	RADAR ALTIMETER #1 CHECK
14	SECURE VOICE CHECK	27	RADAR ALTIMETER #2 CHECK
15	UHF #1 CHECK	28	RADAR BEACON CHECK
16	UHF #2 CHECK	29	SKE CHECK
17	VHF/AM CHECK	30	OMEGA CHECK
18	VHF/FM CHECK	31	INS ALIGNMENT CHECK
19	HF CHECK	32	ESM CHECK
20	TACAN CHECK	33	IRD & W CHECK
21	ILS #1 CHECK	34	IFF CHECK
22	ILS #2 CHECK		

The Test Master Sequencer and the Test Request Processor described in Sections 3.2.1 and 3.2.2 of the GTP-1 will be used during the execution of GTP-2.

### 3.2.2.1 Test Controller (GTP-2)

The Test Controller is activated to initiate testing, when there is a request for a change in test sequence and after each test is completed. It is responsible for the scheduling of the tests. The normal test sequence is shown in Figure

#### 3.2.2.1.1 Inputs

The inputs to the Test Controller shall be as specified in Table XX.

#### 3.2.2.1.2 Processing

Data initialization at start-up shall be signalled by the Start-up Flag Set in the Test Master Sequencer. This data initialization shall be performed by setting the initialization flags in all the modules requiring initialization, then scheduling those modules. Any EQUIPs, DISPs, or SPECs associated with the scheduled test module shall be scheduled also by the Test Controller.

The initialization of a test sequence or a change in one shall be signalled by the Test Request Processor. Changes in the test sequence shall be possible any time unless the nature of the test is such that the completion of a previous test is required. It shall be possible for any test to be scheduled or rescheduled unless the scheduling of one test is dependent upon the results of a previous test. If a test termination is permitted, the Test Controller shall terminate all tasks and clear the displays.

To start the new sequence, the Test Controller shall signal the appropriate test module, then shall activate a DISP to display the test code and the name of the test being scheduled.

When a test is completed, the Test Controller shall retain the results of the test on the displays and shall display the code and name of

TABLE XX INPUTS - GTP-2 TEST CONTROLLER

DATA NAME	SYMBOL	SOURCE	REFERENCE
CONTROLLER INITIALIZATION EVENT		GTP-1 MASTER SEQUENCER	
TASK CODE INDICATOR		GTP-1 REQUEST PROCESSOR	
TASK COMPLETION EVENT		ALL GTP-2 TEST TASKS	

the next test to be performed. This display shall be terminated by a signal from the Test Request Processor signalling that either the next, or a new, task is to be scheduled. The Test Processor shall then display the new test code and name and proceed to schedule the new test.

After the completion of the last test, the Test Processor shall cause the status matrix to be displayed with a 'tests complete' statement.

The processing shall be performed as is specified in Figure 14.

### 3.2.2.1.3 Outputs

The outputs from the Test Controller shall be as specified in Table XXI.

### 3.2.2.2 GTP-2 Test Modules

The GTP-2 Test Modules, enumerated in Figure 12 are generally complete in themselves and may be executed individually or collectively. Exceptions to this rule are the subsystems tests for the INS and the AHRS.

The INS subsystem test comprises two separate tests, the INS Initial Check, which energizes the INS to begin the self-alignment. Later in the test program, after the INS has been allowed sufficient time to complete its self-alignment, the INS alignment Check program module is executed to complete the INS ground test. During this test, the INS true heading is compared with the true heading from the AHRS. Consequently, when the INS is tested, it is necessary to execute all three program modules, i.e., the AHRS check, the INS Initial Check and the INS Alignment Check.

The GTP-2 test modules are designed around the EQUIP program modules which provide in-flight BITE checks in addition to their main task as the software interface between the individual IDAMST Avionics Subsystems and the IDAMST Applications Software.

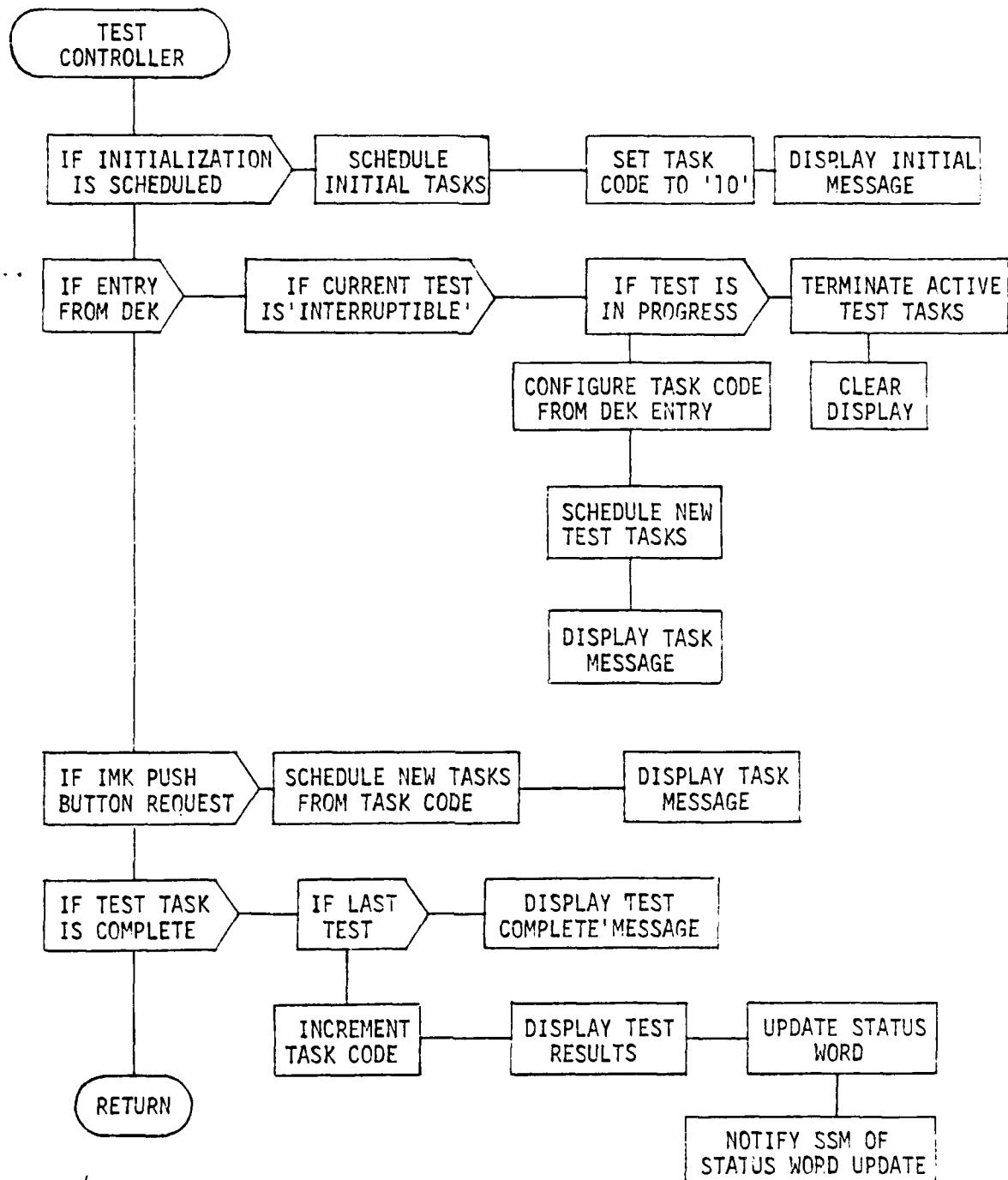


FIGURE 14 GTP-2 TEST CONTROLLER

TABLE XXI      OUTPUTS - GTP-2 TEST CONTROLLER

DATA NAME	SYMBOL	DESTINATION	REFERENCE
TASK INITIALIZATION EVENT		ALL TEST TASKS	
TASK TERMINATION		ALL APPLICABLE TASKS	
TEST RESULTS MESSAGE		MPD DISP	
'CLEAR DISPLAY' MESSAGE		MPD DISP	
'TESTS COMPLETE' MESSAGE		MPD DISP	
STATUS WORD		SUBSYSTEM STATUS MONITOR	

In addition to the BITE checks, the GTP-2 modules will cause test procedures to be displayed on the MPD, instructing the operator to manipulate certain controls and enter applicable data to exercise the subsystem under test.

The results of the individual tests will be displayed on the MPD and, if any out-of-tolerance results occur, the status word will be updated accordingly.

For those test modules involving calculations such as TACAN, Multi-Mode Radar, INS, etc., the applicable SPECS from the OFP will be duplicated in the GTP-2 test module to permit test calculations based on simulated inputs. The results of these calculations will be compared with the pre-calculated correct answers and any deviations from the allowable tolerance will be announced by a message on the MPD.

### 3.2.2.2.1 Intercom Test

This program module tests the Intercommunication Set, AN/AIC-18. This program utilizes the interface features of the intercom EQUIP program module (OFP Application). The program instructs the operator to exercise the control functions of the Intercom Set then provides display outputs for evaluation by the operator.

#### 3.2.2.2.1.1 Inputs

The inputs to this test module shall be the outputs of the intercom EQUIP module.

#### 3.2.2.2.1.2 Processing

This test module shall call the Intercom EQUIP program module which shall provide the software interface between the IDAMST Control/Displays and the Intercom Set.

The test module shall cause a display to instruct the operator to exercise the selector controls. It shall then instruct the operator to signify acceptance or rejection of the operation of the selector controls by

depressing an appropriate button on the DEK. This rejection shall be used to update the status word.

The test module shall cause the display of appropriate failure messages after each separate control feature of the Intercom is tested.

At the conclusion of the test, if the test results are satisfactory, the test module shall cause the display of an appropriate message signifying the acceptability of the Intercom. If the results are unsatisfactory, the test module shall issue a display list describing the nature of the failures.

#### 3.2.2.2.1.3 Outputs

The outputs from this program module shall consist of the status word, display messages, and the test completion event.

#### 3.2.2.2.2 AHRS Test

This program module tests the Attitude and Heading Reference System (AHRS), Lear Seigler #6000A. This program utilizes the interface and BITE features of the AHRS EQUIP (OFP-Applications) program module. It ascertains that the AHRS has had sufficient warm-up, then operates AHRS in both SLAVE and DG modes. The program instructs the operator to exercise the various control modes, then provides display outputs for evaluation by the operator. It checks the outputs of pitch, roll and turn rate are reasonable values while the aircraft is stationary.

#### 3.2.2.2.2.1 Inputs

Inputs to this program module shall be as specified in Table XXII.

TABLE XXII      INPUTS - AHRS TEST

DATA NAME	SYMBOL	SOURCE	REFERENCE
"STEP" COMMAND		PCP EQUIP	
TEST TASK SELECT		IMK EQUIP	
AHRS INPUTS		AHRS EQUIP	
TEST INITIALIZATION EVENT		TEST CONTROLLER	

### 3.2.2.2.2.2 Processing

This test module shall call the AHRS EQUIP program module which shall effect a sufficient warm-up time for the AHRS, shall provide the software interface between the IDAMST Control/Displays and the AHRS and shall detect and display the results of the AHRS BITE tests.

It shall determine if the AHRS outputs of pitch and roll are reasonable values with the aircraft stationary on the ground. It shall cause the results to be displayed on the MPD.

The test module shall determine if the AHRS outputs of turn rate and roll rate are zero with the aircraft stationary on the ground. It shall cause the results to be displayed on the MPD.

The test module shall cause a display to instruct the operator to change the mode to "DG", then to exercise the heading slew control in both directions. The operator shall be instructed to change the mode back to "SLAVE", then to observe that the resulting heading output is reasonable. The test module shall instruct the operator to signify acceptance or rejection of the heading output by depressing an appropriate button on the DEK. This rejection shall be used to update the status word.

The test module shall cause a display to instruct the operator to exercise the "SYNCH" feature including the display of the results to the operator.

The test module shall cause a display to instruct the operator to exercise the "HEMISPHERE SELECT" and "FAST ERECTION COMMAND" features including the display of the results to the operator.

The test module shall cause the display of appropriate failure messages after each separate feature of the AHRS is tested.

At the conclusion of the AHRS test, if the results are satisfactory, the test module shall cause a display of an appropriate message signifying the acceptability of the AHRS. If the results are unsatisfactory, the test module shall cause the display of a message signifying the

unacceptability of the AHRS and a display list describing the nature of the failures.

The processing shall be performed as is specified in Figure 15.

#### 3.2.2.2.3 Outputs

The outputs from this test module shall be as specified in Table XXIII.

#### 3.2.2.3 Initial INS Test

This program module energizes the Inertial Navigation System (INS) to initiate the alignment process prior to the INS Alignment Test (see Section 3.2.2.2.22). The program instructs the operator to set the proper controls then provides display outputs for evaluation by the operator. This program utilizes the interface features of the INS EQUIP program module (OFP-Applications).

#### 3.2.2.3.1 Inputs

The inputs to this program module shall be as specified in Table XXIV.

#### 3.2.2.3.2 Processing

This test module shall call the INS EQUIP program module which shall provide the software interface between the IDAMST Control/Displays and the INS and shall detect and display the INS BITE tests.

The test module shall cause a display to instruct the operator to properly control the INS to initiate the INS Alignment.

The processing shall be performed as specified in Figure 16.

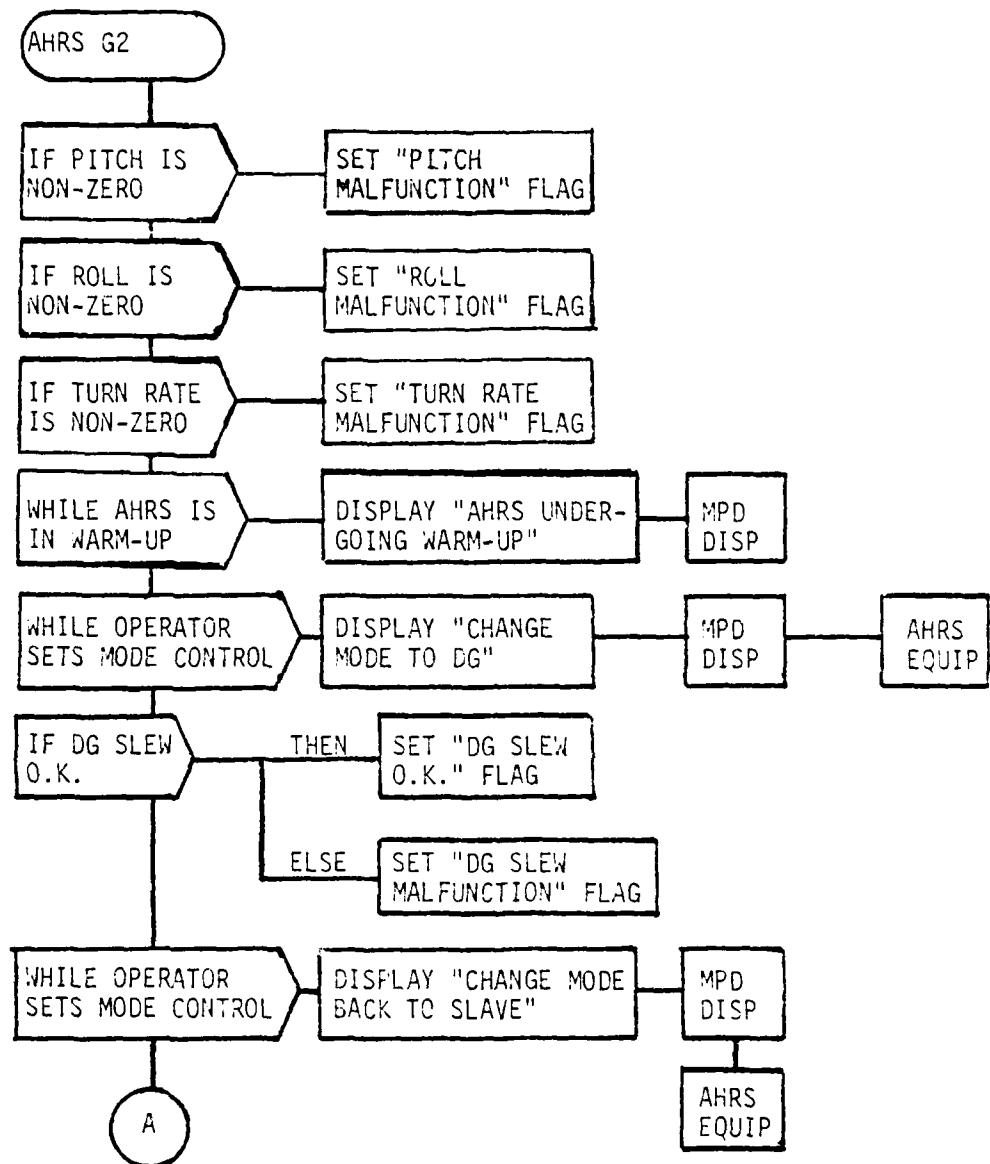


FIGURE 15

AHRS TEST

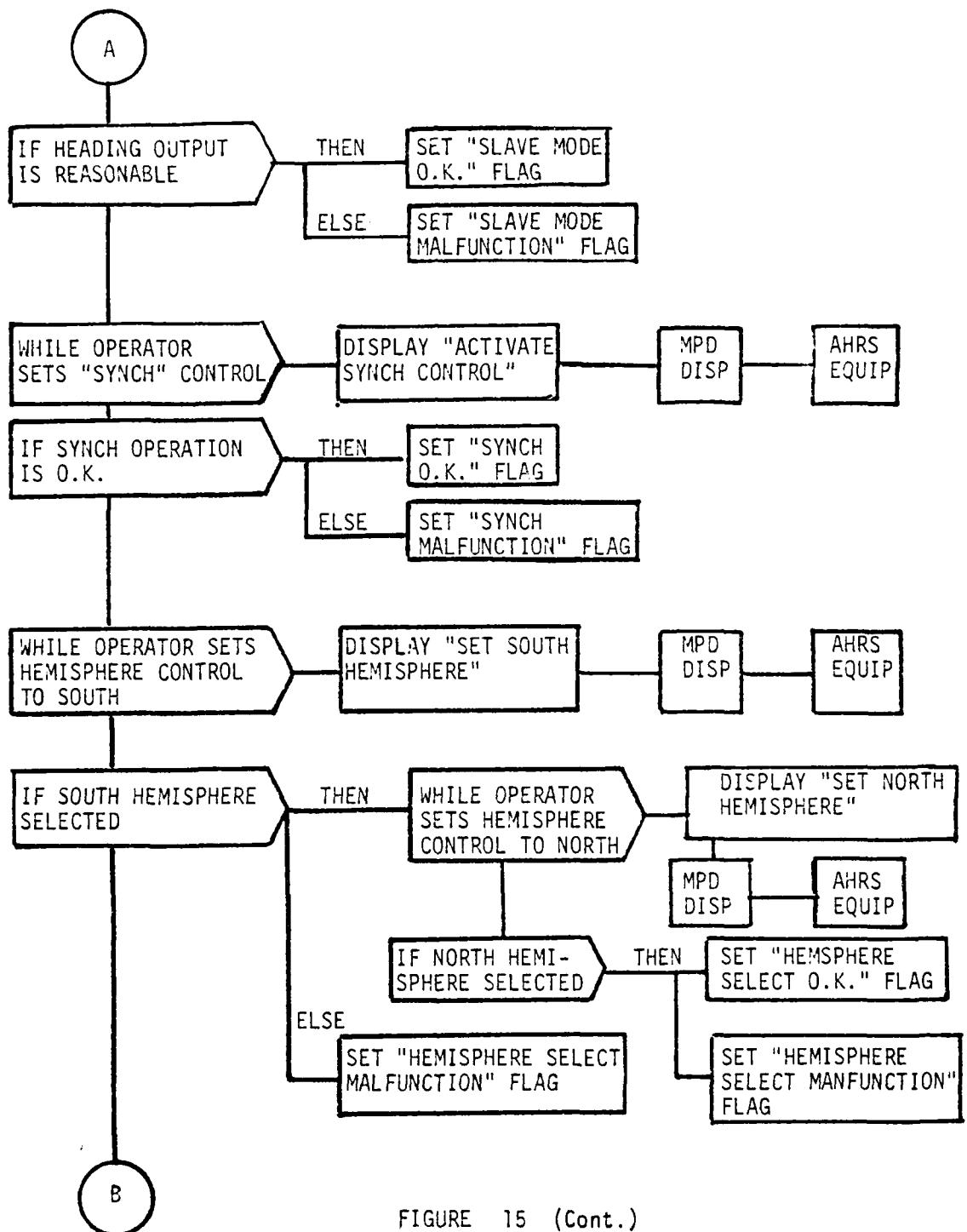


FIGURE 15 (Cont.)

AHRS TEST

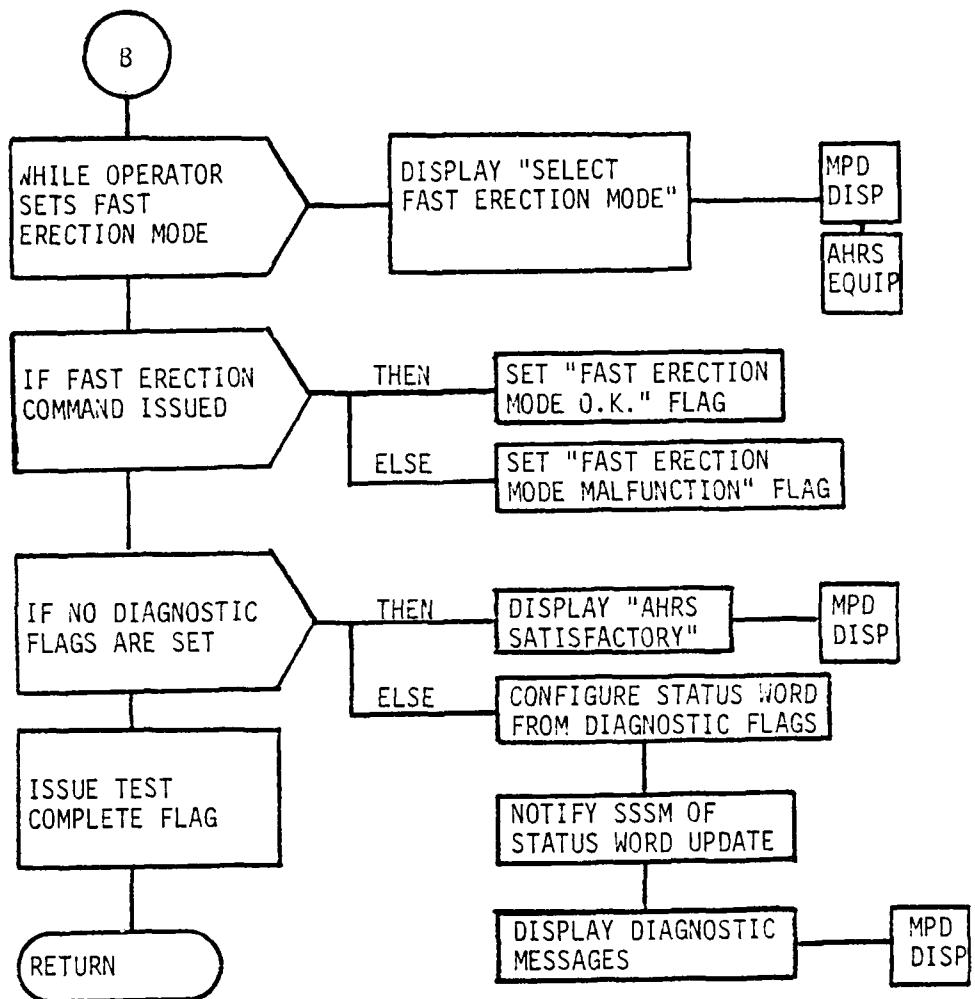


FIGURE 15 (Cont.)

AHRS TEST

TABLE XXIII      OUTPUTS - AHRS TEST

DATA NAME	SYMBOL	DESTINATION	REFERENCE
STATUS WORD		SSSM	
DISPLAY MESSAGES		MDDG EQUIP	
TEST COMPLETE EVENT		TEST CONTROLLER	

TABLE XXIV      INPUTS - INITIAL INS TEST

DATA NAME	SYMBOL	SOURCE	REFERENCE
IMS INPUTS TEST INITIALIZATION EVENT		IMS EQUIP TEST CONTROLLER	

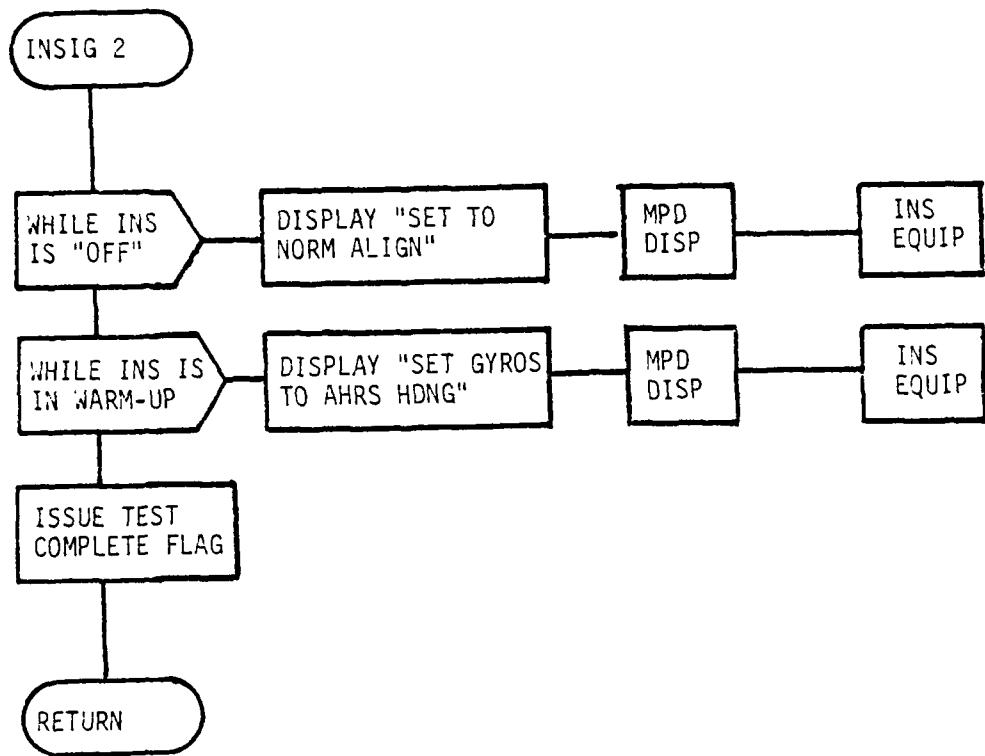


FIGURE 16

INITIAL INS TEST

### 3.2.2.2.3.3 Outputs

The outputs from this test module shall be as specified in Table XXV.

### 3.2.2.2.4 Public Address System Test

This program module tests the Public Address System, AN/AIC-13. It utilizes the interface features of the Public Address EQUIP Program module. The program instructs the operator to exercise the control selectors then provides display outputs for evaluation by the operator.

#### 3.2.2.2.4.1 Inputs

The inputs to this test module shall be the outputs of the Public Address EQUIP module.

#### 3.2.2.2.4.2 Processing

This test module shall call the Public Address EQUIP program module which shall provide the software interface between the IDAMST Control/Displays and the Public Address System.

The test module shall cause a display to instruct the operator to exercise the control selector options. It shall then instruct him to signify acceptance or rejection of the results by depressing an appropriate button on the DEK. This rejection shall be used to update the status word.

The test module shall cause the display of appropriate failure messages after each separate control feature of the Public Address System is tested.

At the conclusion of the tests, if the results are satisfactory, the test module shall display an appropriate message signifying the acceptability of the Public Address System. If the test results are unsatisfactory, the test module shall issue a display list describing the nature of the failures.

TABLE XXV      OUTPUTS - INITIAL INS TEST

DATA NAME	SYMBOL	DESTINATION	REFERENCE
STATUS WORD		SSSM	
DISPLAY MESSAGES		MPDG EQUIP	
TEST COMPLETE EVENT		TEST CONTROLLER	

#### 3.2.2.2.4.3 Outputs

The outputs from this test module shall consist of the status word, display messages, and test completion event.

#### 3.2.2.2.5 Speech Security Set Test

This program module tests the Speech Security Set, TSEC/KY-58. It utilizes the interface features of the Speech Security Set EQUIP program module (OFP-Application). The program instructs the operator to exercise the control and mode selectors, then provides display outputs for evaluation by the operator.

##### 3.2.2.2.5.1 Inputs

The inputs to this test module shall be the outputs of the Speech Security Set EQUIP module.

##### 3.2.2.2.5.2 Processing

This test module shall call the Speech Security Set EQUIP which shall provide the software interface between the IDAMST Control/Displays and the Speech Security Set.

The test module shall display instructions to the operator to exercise the control and mode selectors. It shall then instruct the operator to observe and evaluate the resulting response then signify acceptance or rejection of the operation of the control of mode selectors by depressing an appropriate button on the DEK. This rejection shall be used to update the status word.

The test module shall display the appropriate failure messages after each separate control feature of the Speech Security Set is tested.

At the conclusion of the test, if the results are satisfactory, the test module shall display an appropriate message signifying the acceptability of the Speech Security Set. If the test results are unsatisfactory, the test module shall issue a display list describing the nature of the failures.

### 3.2.2.2.5.3 Outputs

The outputs from this test module shall consist of the status word, display messages, and test completion event.

### 3.2.2.2.6 UHF #1 Test

This program module tests the UHF Radio Transceiver, AN/ARC-164. This program utilizes the interface features of the UHF EQUIP program module (OFP-Application). The program instructs the operator to exercise the control and frequency selection functions, then provides display outputs for evaluation by the operator.

#### 3.2.2.2.6.1 Inputs

The inputs to this test module shall be the outputs of the UHF EQUIP module.

#### 3.2.2.2.6.2 Processing

This test module shall call the UHF EQUIP program module which shall provide the software interface between the IDAMST Control/Displays and the UHF Transceiver.

The test module shall display instructions to the operator to exercise the control and frequency selectors. It shall instruct the operator to observe and evaluate the resulting response, then signify acceptance or rejection of the operation of the control and frequency selectors by depressing an appropriate button on the DEK. This rejection shall be used to update the status word.

The test module shall display the appropriate failure messages after each separate control feature of the UHF Transceiver is tested.

At the conclusion of the test, if the results are satisfactory, the test module shall display an appropriate message signifying the acceptability of the UHF Transceiver. If the test results are unsatisfactory, the test module shall issue a display list describing the nature of the failure.

#### 3.2.2.2.6.3 Outputs

The outputs from this test module shall consist of the status word, display messages, and test completion event.

#### 3.2.2.2.7 UHF #2 Test

This program module is identical to that module described in paragraph 3.2.2.2.6 except for the address of the UHF EQUIP called by the test program module.

#### 3.2.2.2.8 VHF/AM Transceiver Test

This program module tests the VHF/AM Transceiver Set, AN/ARC-115R. This program utilizes the interface features of the VHF/AM EQUIP program module (See OFP Application). The program instructs the operator to exercise the mode control and frequency select functions of the VHF/AM Set then provides display outputs for evaluation by the operator.

##### 3.2.2.2.8.1 Inputs

The inputs to this test module shall be the outputs of the VHF/AM EQUIP module.

##### 3.2.2.2.8.2 Processing

This test module shall call the VHF/AM EQUIP program module which shall provide the software interface between the IDAMST Control/Displays and the VHF/AM Set.

The test module shall display instructions to the operator to exercise the mode control and frequency selectors. It shall instruct the operator to observe and evaluate the resulting response, then signify acceptance or rejection of the operation of the mode control and frequency selectors by depressing an appropriate button on the DEK. This rejection shall be used to update the status word.

The test module shall display the appropriate failure messages after each separate control feature of the VHF/AM Set is tested.

At the conclusion of the test, if the results are satisfactory, the test module shall display an appropriate message signifying the acceptability of the VHF/AM Transceiver. If the test results are unsatisfactory, the test module shall issue a display list describing the nature of the failure.

#### 3.2.2.2.8.3 Outputs

The outputs from this test module shall consist of the status word, display messages, and test completion event.

#### 3.2.2.2.9 VHF/FM Transceiver Test

This program module tests the VHF/FM Transceiver, FM-622A. This program utilizes the interface features of the VHF/FM EQUIP program module (OFP-Application). The program instructs the operator to exercise the mode control and frequency selector functions, then provides display outputs for evaluation by the operator.

#### 3.2.2.2.9.1 Inputs

The inputs to this test module shall be the outputs of the VHF/FM EQUIP module.

### 3.2.2.2.9.2 Processing

This test module shall call the VHF/FM EQUIP program module which shall provide the software interface between the IDAMST Control/Displays and the VHF/FM Set.

The test module shall display instructions to the operator to exercise the control and frequency selectors. It shall instruct the operator to observe and evaluate the resulting response, then signify acceptance or rejection of the operation of the control and frequency selectors by depressing an appropriate button on the DEK. This rejection shall be used to update the status word.

The test module shall display the appropriate failure messages after each separate control feature of the VHF/FM Set is used.

At the conclusion of the test, if the results are satisfactory, the test module shall display an appropriate message signifying the acceptability of the VHF/FM Transceiver. If the results are unsatisfactory, the test module shall issue a display list describing the nature of the failure.

### 3.2.2.2.9.3 Outputs

The outputs from this test module shall consist of the status word, display messages, and test completion event.

### 3.2.2.2.10 TACAN Test

This program module tests the TACAN Receiver/Transmitter, AN/ARN-118. This program utilizes the interface and BITE features of the TACAN EQUIP program module. It ascertains that the TACAN has had sufficient warm-up time, then operates the TACAN in all three modes, "REC," "A/A REC," and "A/A T/R." The program instructs the operator to exercise the various controls, then provides display outputs for evaluation by the operator. It will execute navigational fix computations in the three modes based on simulated TACAN inputs and will provide display data of the results for evaluation

by the operator.

#### 3.2.2.2.10.1 Inputs

The inputs to this program module shall be as specified in Table XXVI.

#### 3.2.2.2.10.2 Processing

This test module shall call the TACAN EQUIP program module which shall provide the software interface between the IDAMST Control/Displays and the TACAN Receiver/Transmitter and shall detect and display the TACAN BITE tests.

The test module shall provide inputs to simulate the TACAN slant range and bearing signals for the purpose of determining the navigational fix computation capability of the TACAN Receiver Section. The test module shall use the Nav Brute Force SPEC for this computation. The program shall provide for navigational fix problems in each of the three TACAN modes of operation.

The test module shall cause a display to instruct the operator to exercise all control features of the TACAN Receiver/Transmitter. It shall then instruct the operator to signify acceptance or rejection of the operation of each control feature by depressing an appropriate button on the DEK. This rejection shall be used to update the status word.

The test module shall cause the display of appropriate failure messages after each separate control feature of the TACAN Receiver/Transmitter is tested.

The processing shall be performed as is specified in Figure 17.

#### 3.2.2.2.10.3 Outputs

The outputs from this test module shall be as specified in Table XXVII.

TABLE XXVI      INPUTS - TACAN TEST

DATA NAME	SYMBOL	SOURCE	REFERENCE
TACAN INPUTS TEST INITIALIZATION EVENT		TACAN EQUIP TEST CONTROLLER	

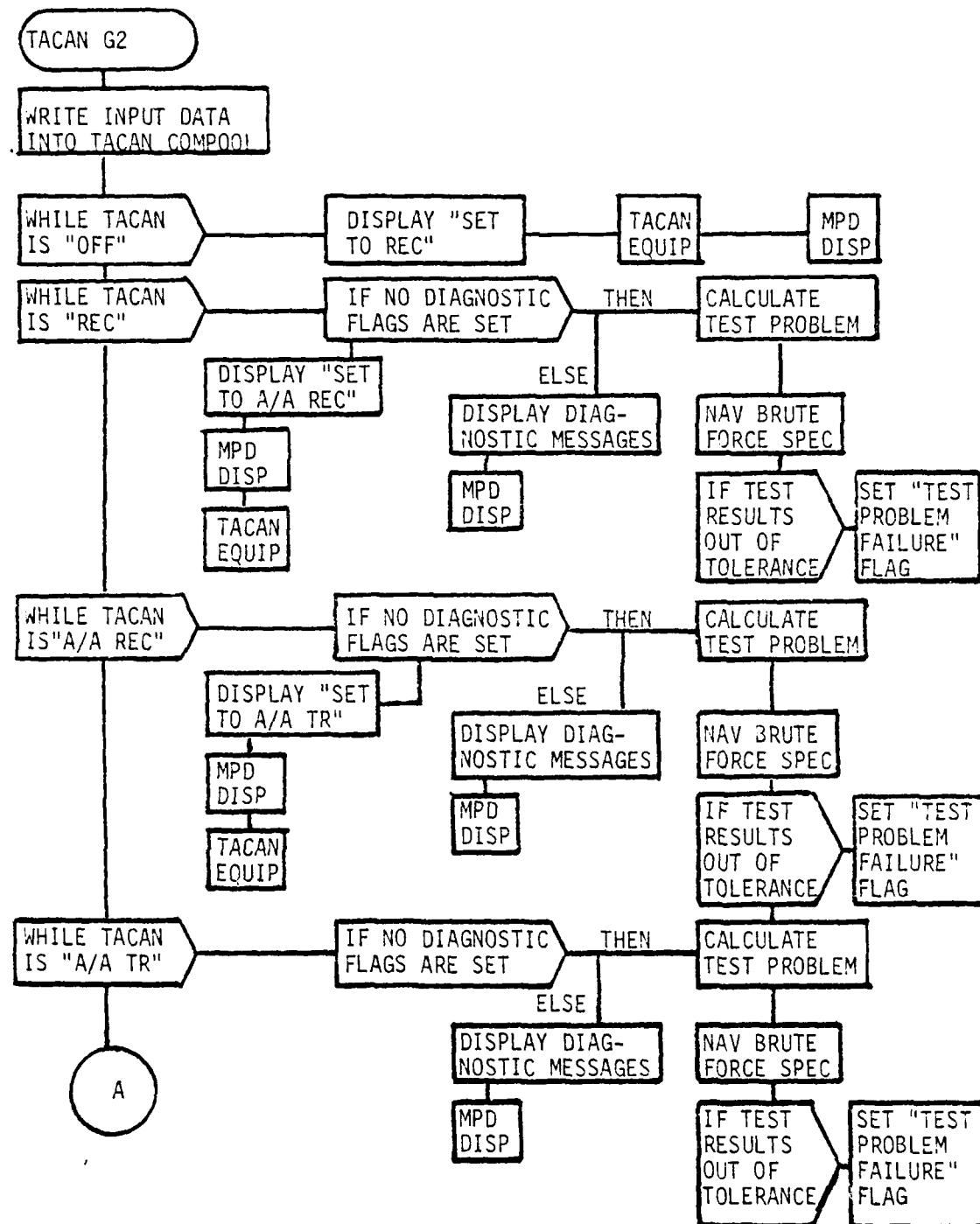


FIGURE 17

TACAN TEST

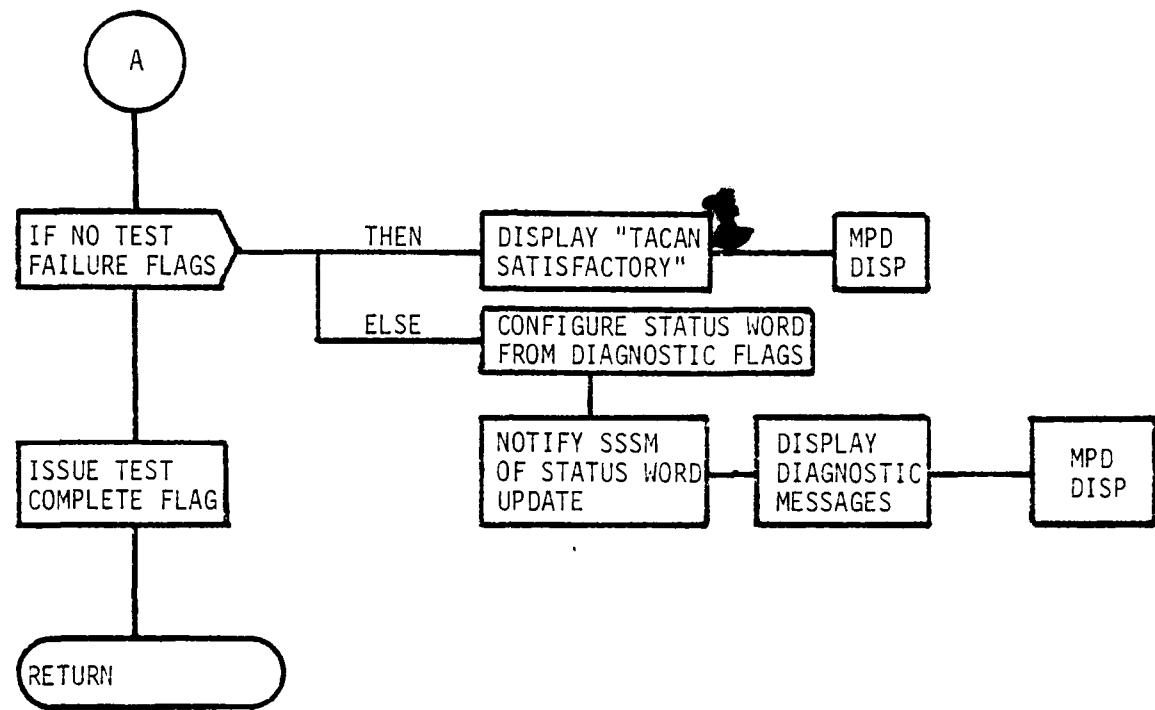


FIGURE 17 (Cont.)

TACAN TEST

TABLE XXVII      OUTPUTS - TACAN TEST

DATA NAME	SYMBOL	DESTINATION	REFERENCE
STATUS WORD		SSSM	
DISPLAY MESSAGES		MPDG EQUIP	
TEST COMPLETE EVENT		TEST CONTROLLER	

### 3.2.2.2.11 Instrument Landing System (ILS) #1 Test

This program module tests the Instrument Landing System (ILS) Receiver, AN/ARN-108. This program utilizes the interface and BITE features of the ILS EQUIP program module (see OFP-Application). The program instruct the operator to exercise the control and frequency selection functions, then provides display outputs for evaluation by the operator.

#### 3.2.2.2.11.1 Inputs

The inputs to this program module shall be as specified in Table

#### 3.2.2.2.11.2 Processing

This test module shall call the ILS EQUIP program module which shall provide the software interface between the IDAMST Control/Displays and the ILS Receiver and shall detect and display the results of the ILS BITE tests.

The test module shall cause a display to instruct the operator to exercise the frequency selector control. It shall then instruct the operator to signify acceptance or rejection of the operation of the frequency selector by depressing an appropriate button on the DEK. This rejection shall be used to update the status word.

The test module shall cause the display of appropriate failure messages after each separate control feature of the ILS Receiver is tested.

At the conclusion of the ILS test, if the test results are satisfactory, the test module shall cause the display of an appropriate message signifying the acceptability of the ILS Receiver. If the test results are unsatisfactory, the test module shall issue a display list describing the nature of the failures.

The processing shall be performed as is specified in Figure 18.

TABLE XXVIII      INPUTS - ILS TEST

DATA NAME	SYMBOL	SOURCE	REFERENCE
ILS INPUTS TEST INITIALIZATION EVENT		ILS EQUIP TEST CONTROLLER	

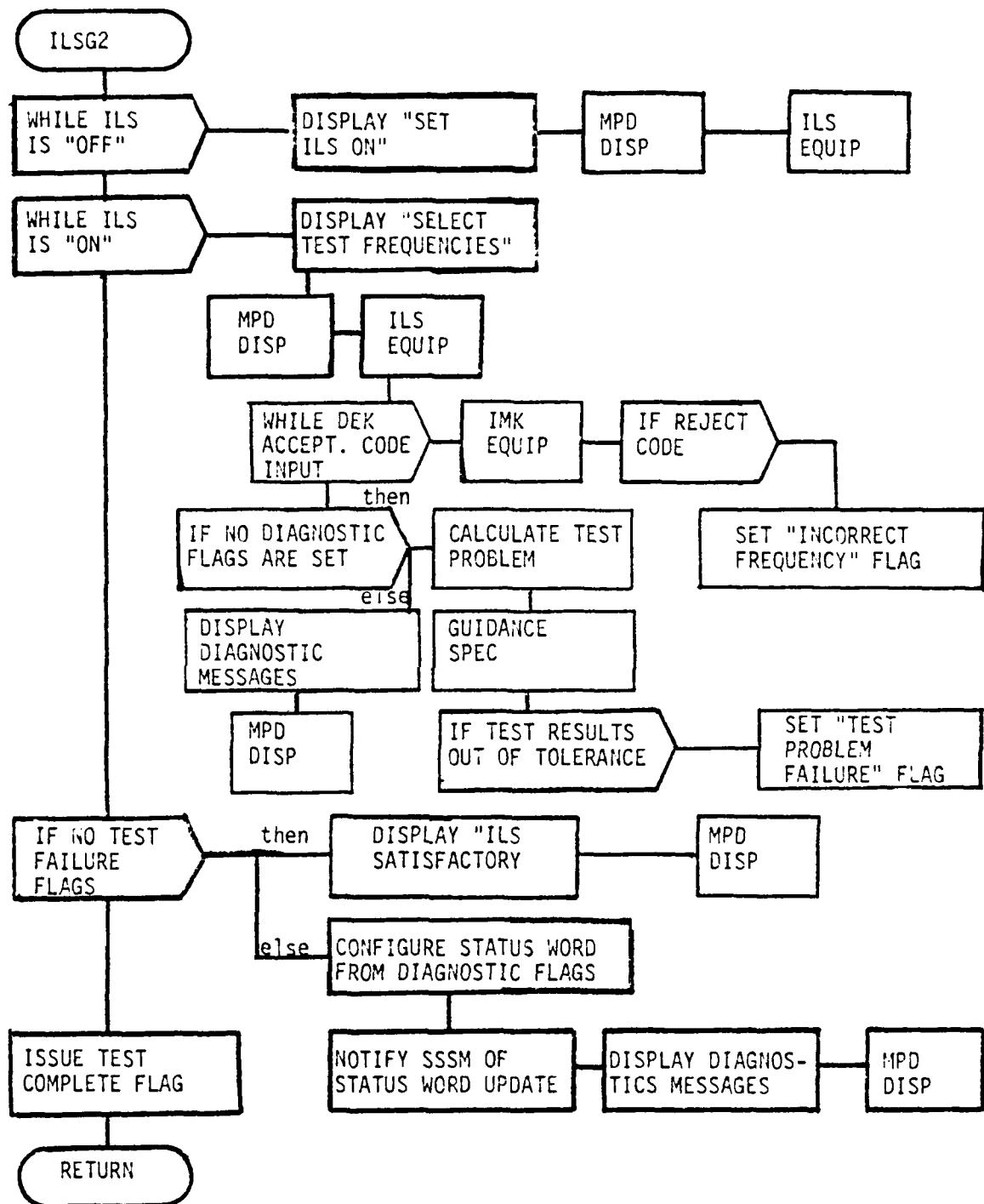


FIGURE 18 ILS TEST

### 3.2.2.2.11.3 Outputs

The outputs from this test module shall be as specified in Table XXIX.

### 3.2.2.2.12 Instrument Landing System (ILS) #2 Test

This program module is identical with that described in paragraph 3.2.2.2.11 except for the address of the ILS EQUIP called by the test program module.

### 3.2.2.2.13 LF/ADF Receiver Test

This program module tests the LF/ADF Receiver, Collins #DF-206. This program utilizes the interface and BITE features of the LF/ADF EQUIP program module (see OFP-Application). The program instructs the operator to exercise the control and frequency functions, then provides display outputs for evaluation by the operator. The program additionally instructs the operator to initiate the self-test mode, then provides display outputs for evaluation.

#### 3.2.2.2.13.1 Inputs

The inputs to this program module shall be as specified in Table XXX.

#### 3.2.2.2.13.2 Processing

This test module shall call the LF/ADF EQUIP program module which shall provide the software interface between the IDAMST Control/Displays and the LF/ADF Receiver and shall detect and display the results of the LF/ADF BITE tests.

The test module shall cause a display to instruct the operator to exercise the frequency selector, the mode control and the self-test feature. It shall then instruct the operator to signify acceptance or rejection of the operation by depressing an appropriate button on the DEK. This rejection shall be used to update the status word.

TABLE XXIX      OUTPUTS - ILS TEST

DATA NAME	SYMBOL	DESTINATION	REFERENCE
STATUS WORD		SSSM	
DISPLAY MESSAGES		MPDG EQUIP	
TEST COMPLETE EVENT		TEST CONTROLLER	

TABLE XXX      INPUTS - LF/ADF TEST

DATA NAME	SYMBOL	SOURCE	REFERENCE
LF/ADF INPUTS TEST INITIALIZATION EVENT		LF/ADF EQUIP TEST CONTROLLER	

The test module shall cause the display of an appropriate failure after each separate control feature of the LF/ADF Receiver is tested.

At the conclusion of the LF/ADF test, if the test results are satisfactory, the test module shall cause the display of an appropriate message signifying the acceptability of the LF/ADF. If the results are unsatisfactory, the test module shall issue a display list describing the nature of the failure.

The processing shall be performed as is specified in Figure 19.

#### 3.2.2.2.13.3 Outputs

The outputs from this test module shall be as specified in Table XXXI.

#### 3.2.2.2.14 Multi-Mode Radar Test

This program module tests the Multi-Mode Radar Set, AN/APQ-122(V)5. This program utilizes the interface and BITE features of the Multi-Mode Radar EQUIP program module (see QFP-Application). The program instructs the operator to exercise the various control modes, then provides display outputs for evaluation by the operator. It will also execute a navigational fix computation based on inputs inserted by the operator via the Hand Control Unit.

##### 3.2.2.2.14.1 Inputs

The inputs to this program module shall be as specified in Table XXXII.

##### 3.2.2.2.14.2 Processing

This test module shall call the MMRAD EQUIP program module which shall provide the software interface between the IDAMST Control/Displays and the Multi-Mode Radar Set and shall detect and display the results of the Multi-Mode Radar BITE tests.

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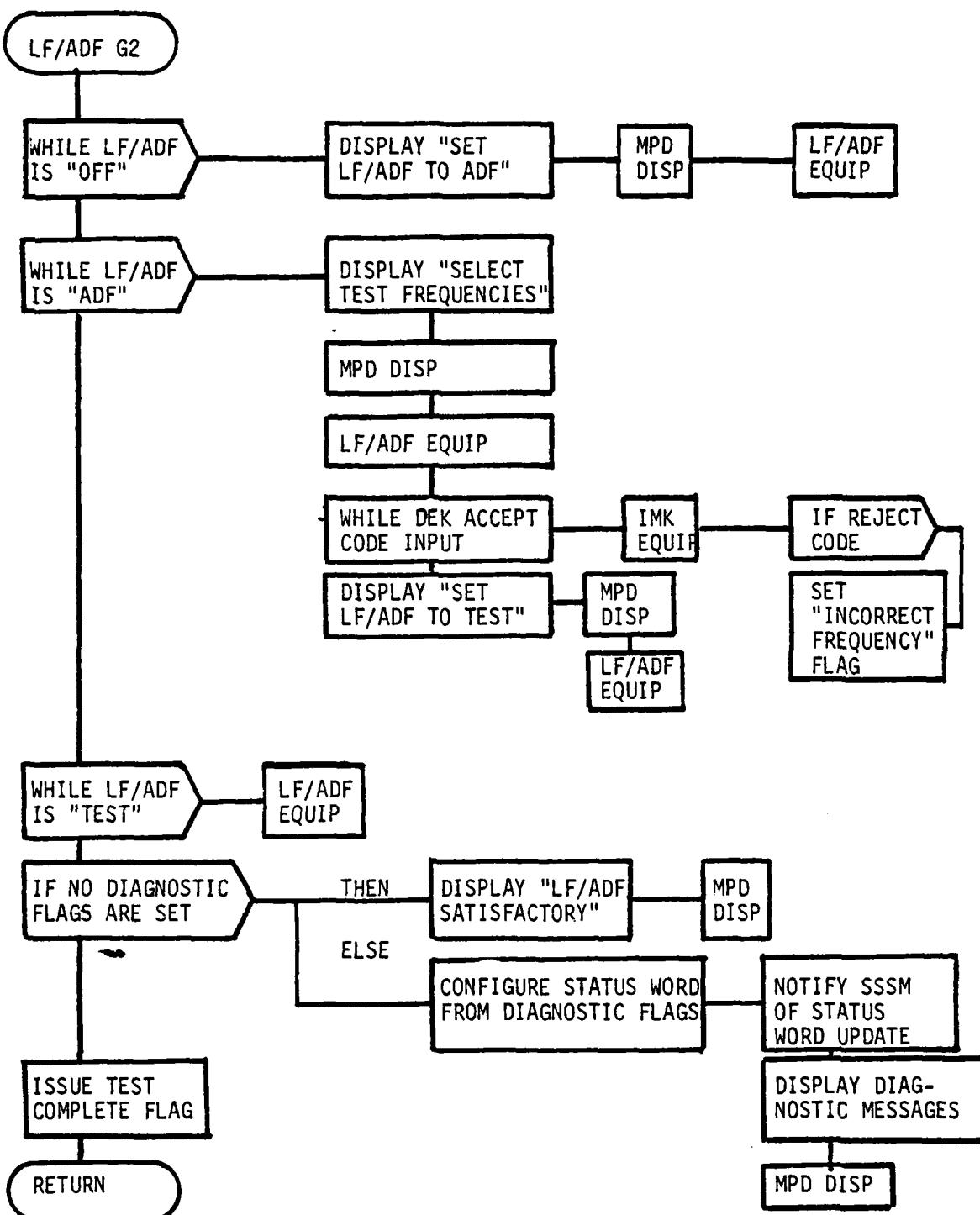


FIGURE 19

LF/ADF TEST

TABLE XXXI            OUTPUTS - LF/ADF TEST

DATA NAME	SYMBOL	DESTINATION	REFERENCE
STATUS WORD		SSSM	
DISPLAY MESSAGES		MPDG EQUIP	
TEST COMPLETE EVENT		TEST CONTROLLER	

TABLE XXXII      INPUTS - MULTI-MODE RADAR TEST

DATA NAME	SYMBOL	SOURCE	REFERENCE
"STEP" COMMAND		IMK EQUIP	
TEST TASK SELECT		IMK EQUIP	
MULTI-MODE RADAR INPUTS		MMRAD EQUIP	
TEST INITIALIZATION EVENT		TEST CONTROLLER	

The test module shall cause a display to instruct the operator to exercise all the operational modes. It shall then instruct the operator to signify acceptance or rejection of each operational mode by depressing an appropriate button on the DEK. This rejection shall be used to update the status word.

The test module shall cause the display of appropriate failure messages after each separate feature of the Radar Set is tested.

The test module shall instruct the operator to exercise the Hand Control Unit (HCU) to ascertain its proper functioning. It shall then instruct the operator to position the cursor with the HCU on a particular range and bearing position for the purpose of determining the navigational fix computation capability of the Radar Set. The test module shall use the Nav Brute Force SPEC for this computation.

The processing shall be performed as is specified in Figure 20.

#### 3.2.2.2.14.3 Outputs

The outputs from this test module shall be as specified in Table XXXIII.

#### 3.2.2.2.15 Radar Altimeter #1 Test

This program module tests the Radar Altimeter System, AN/APN-194. This program utilizes the interface and BITE features of the Radar Altimeter EQUIP program module (see OFP-Application). It provides sufficient warm-up time, then operates the Radar Altimeter in the test mode. The program instructs the operator to initiate the self-test mode and provides display outputs for evaluation by the operator.

#### 3.2.2.2.15.1 Inputs

The inputs to this program module shall be as specified in Table XXXIV.

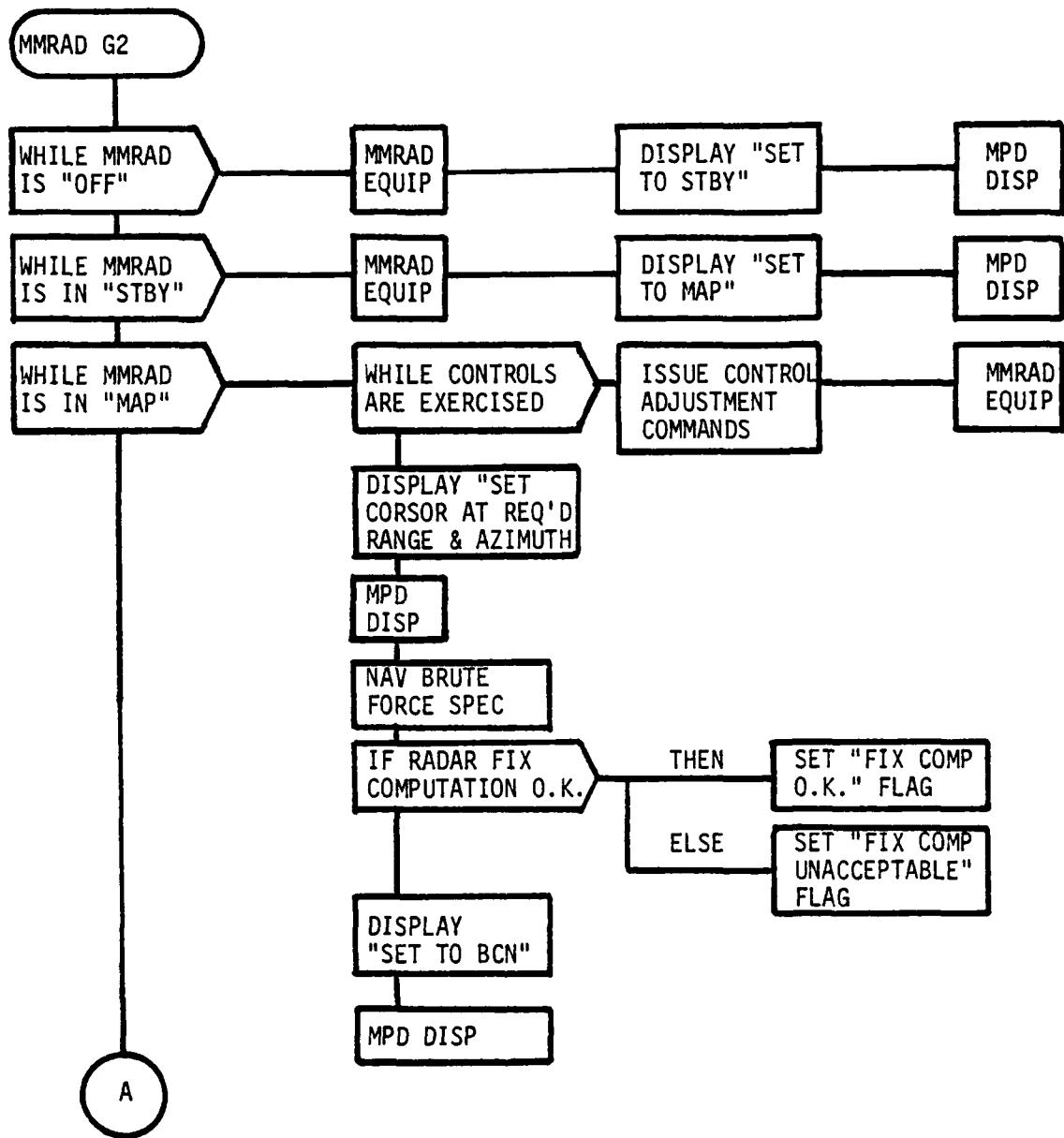


FIGURE 20

MULTI-MODE RADAR TEST

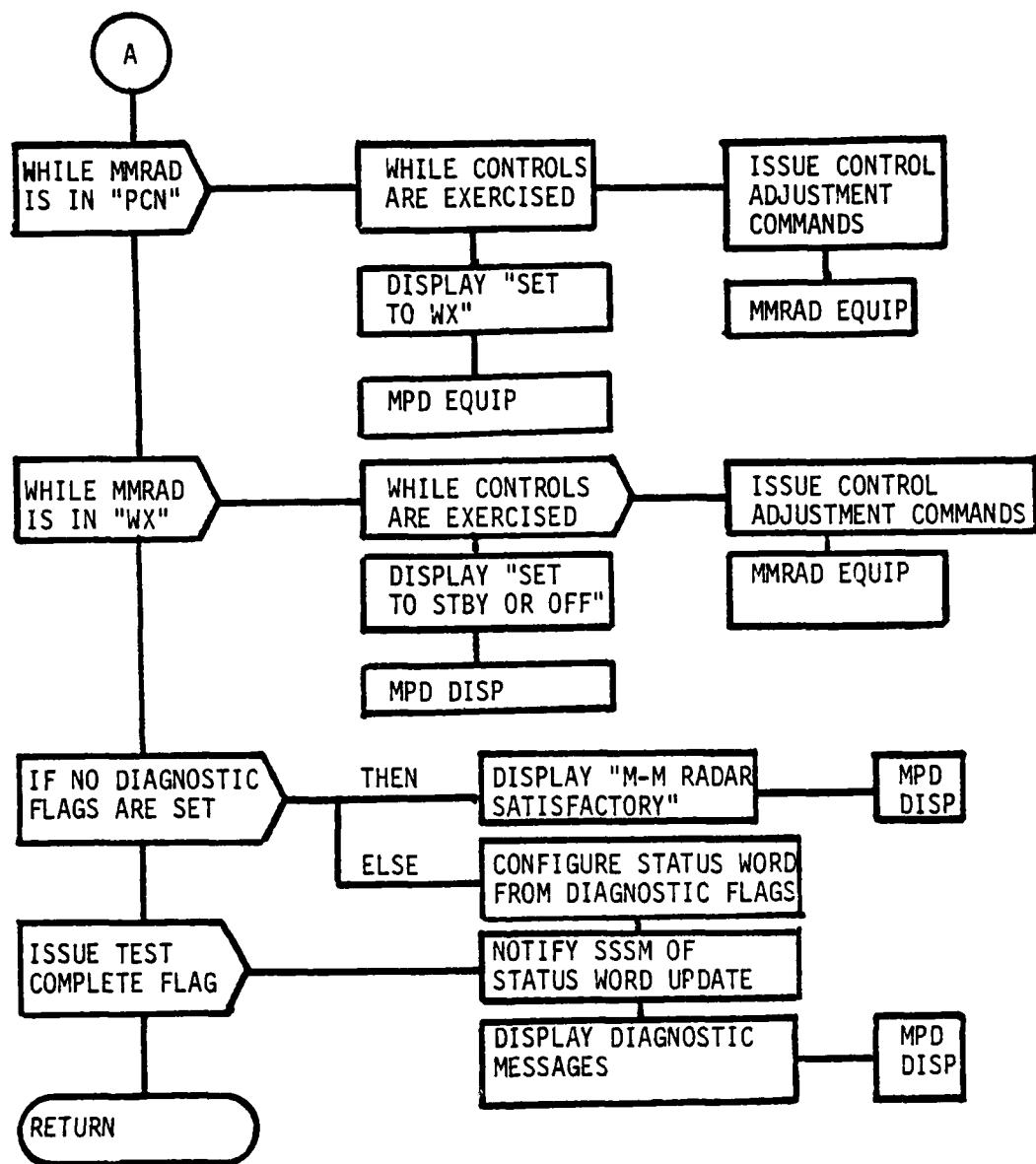


FIGURE 20 (Cont.)

MULTI-MODE RADAR TEST

TABLE XXXIII      OUTPUTS - MULTI-MODE RADAR TEST

DATA NAME	SYMBOL	DESTINATION	REFERENCE
STATUS WORD		SSSM	
DISPLAY MESSAGES		MPDG EQUIP	
TEST COMPLETE EVENT		TEST CONTROLLER	

TABLE XXXIV            INPUTS - RADAR ALTIMETER TEST

DATA NAME	SYMBOL	SOURCE	REFERENCE
"STEP" COMMAND		IMK EQUIP	
TEST TASK SELECT		IMK EQUIP	
RADAR ALTIMETER INPUTS		RADALT EQUIP	
TEST INITIALIZATION EVENT		TEST CONTROLLER	

### 3.2.2.2.15.2 Processing

This test module shall call the RADALT EQUIP program module which shall effect a sufficient warm-up time for the Radar Altimeter, shall provide the software interface between the IDAMST Control/Displays and the Radar Altimeter and shall detect and display the results of the Radar Altimeter BITE tests.

The test module shall cause a display to instruct the operator to initiate the Radar Altimeter Self-Test mode.

At the conclusion of the Radar Altimeter Test, if the results are satisfactory, the test module shall cause the display of an appropriate message signifying the acceptability of the Radar Altimeter. If the results are unsatisfactory, the test module shall cause the display of a message signifying the unacceptability of the Radar Altimeter and a display list describing the nature of the failures.

The processing shall be performed as is specified in Figure

### 3.2.2.2.15.3 Outputs

The outputs from the test module shall be as specified in Table XXXV.

### 3.2.2.2.16 Radar Altimeter #2 Test

This program module is identical with that described in 3.2.2.2.15 except for the address of the Radar Altimeter EQUIP called by the test program module.

### 3.2.2.2.17 Radar Beacon Test

This program module tests the Transponder Set (Radar Beacon), AN/UPN-25. This program utilizes the interface features of the Radar Beacon Transponder EQUIP program module. The program instructs the operator to select the mode of operation of the Radar Beacon in conjunction with the AN/UPM-138 Confidence Test Set, then provides display outputs for evaluation

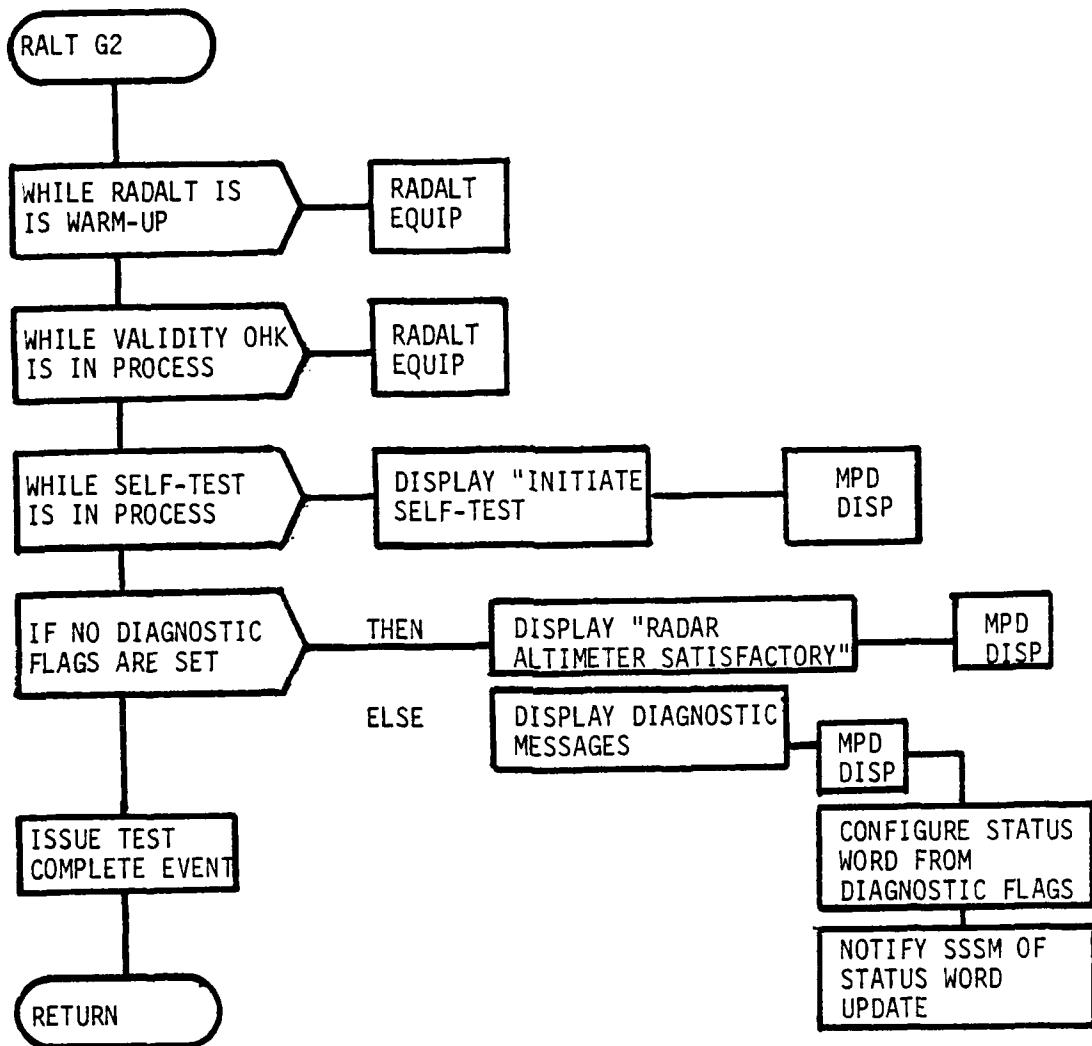


FIGURE 21

RADAR ALTIMETER TEST

TABLE XXXV            OUTPUTS - RADAR ALTIMETER TEST

DATA NAME	SYMBOL	DESTINATION	REFERENCE
STATUS WORD		SSSM	
DISPLAY MESSAGES		MPDG EQUIP	
TEST COMPLETE EVENT		TEST CONTROLLER	

by the operator.

#### 3.2.2.2.17.1 Inputs

The inputs to this program module shall be as specified in Table XXXVI.

#### 3.2.2.2.17.2 Processing

This test module shall call the Radar Beacon EQUIP program module which shall provide the software interface between the IDAMST Control/Displays and the Radar Beacon Receiver.

The test module shall cause a display to instruct the operator to employ the Radar Beacon Confidence Test Set, AN/UPM-138, to operate in conjunction with the Radar Beacon. It shall then instruct the operator to change operating modes and to signify the acceptance or rejection of the results by depressing an appropriate button on the DEK. This rejection shall be used to update the status word.

The test module shall cause the display of an appropriate failure message after each separate control feature of the Radar Beacon is tested.

At the conclusion of the Radar Beacon Test, if the test results are satisfactory, the test module shall cause the display of an appropriate message signifying the acceptability of the Radar Beacon. If the results are unsatisfactory, the test module shall issue a display list describing the nature of the failure.

The processing shall be performed as specified in Figure 22.

#### 3.2.2.2.17.3 Outputs

The outputs from this test module shall be as specified in Table XXXVII.

TABLE XXXVI      INPUTS - RADAR BEACON TEST

DATA NAME	SYMBOL	SOURCE	REFERENCE
RADBCN INPUTS TEST INITIALIZATION EVENT		RADBCN EQUIP TEST CONTROLLER	

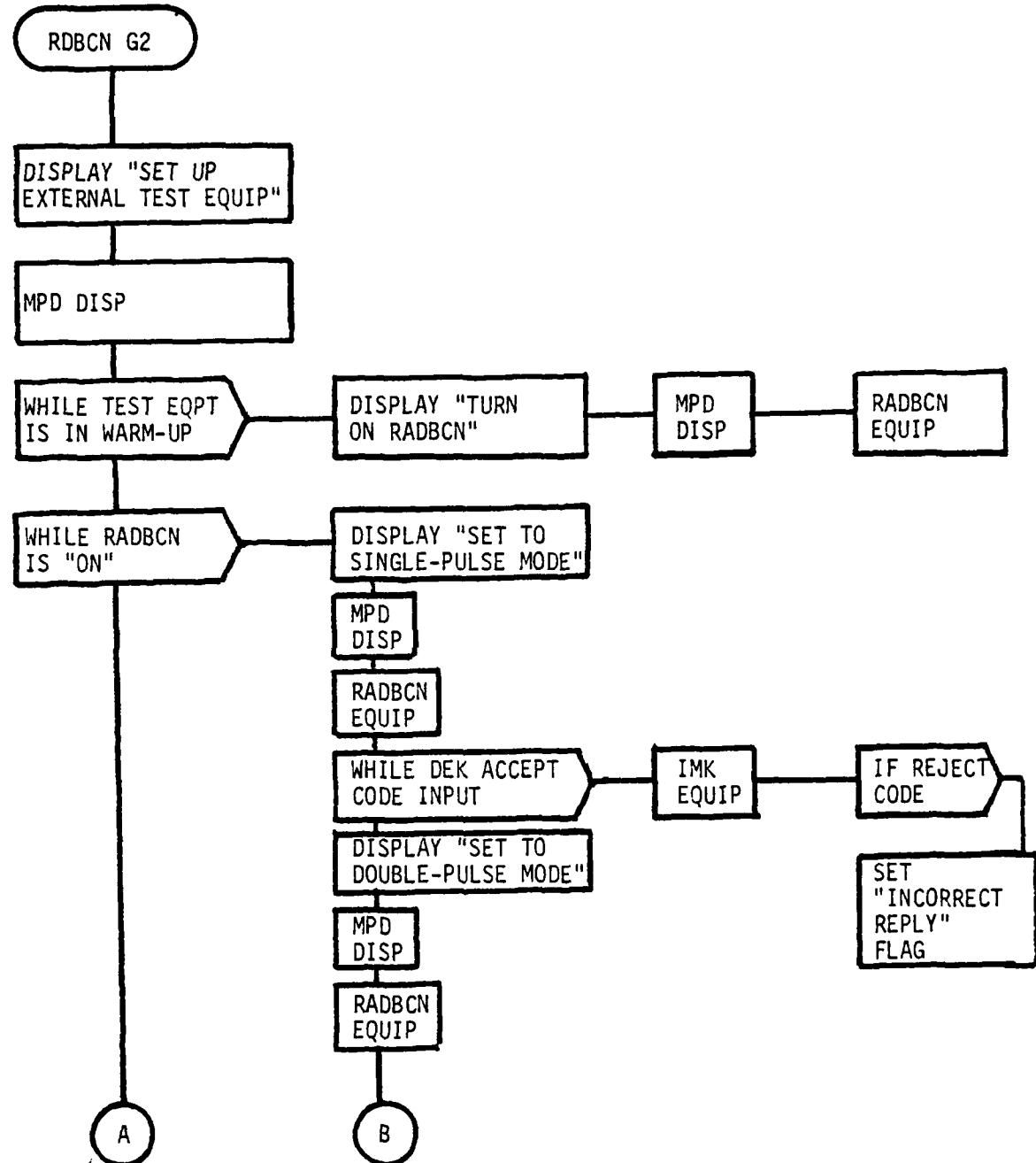


FIGURE 22

RADAR BEACON TEST

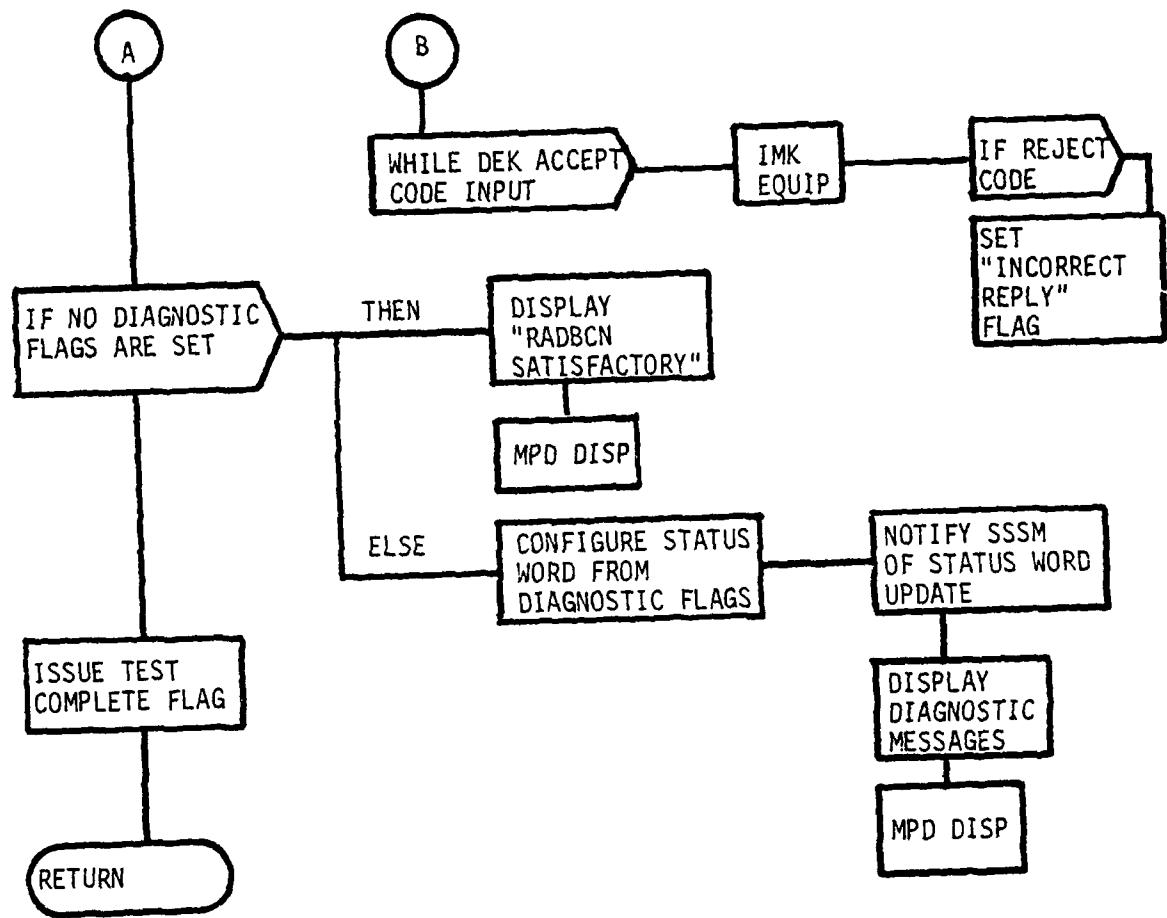


FIGURE 22 (Cont.)

RADAR BEACON TEST

TABLE XXXVII      OUTPUTS - RADAR BEACON TEST

DATA NAME	SYMBOL	DESTINATION	REFERENCE
STATUS WORD		SSSM	
DISPLAY MESSAGES		MPDG EQUIP	
TEST COMPLETE EVENT		TEST CONTROLLER	

### 3.2.2.2.18 Station Keeping Equipment (SKE) Test

This program module tests the Station Keeping Equipment (SKE), AN/APN-169B. This program utilizes the interface and BITE features of the SKE EQUIP program module (see OFP-Application). The program instructs the operator to exercise the various control and test modes, then provides display outputs for evaluation by the operator. It will also execute a navigational fix computation based on simulated zone marker inputs.

#### 3.2.2.2.18.1 Inputs

The inputs to this program module shall be as specified in Table XXXVIII.

#### 3.2.2.2.18.2 Processing

This test module shall call the SKE EQUIP program module which shall provide the software interface between the IDAMST Control/Displays and the SKE and shall detect and display the results of the SKE BITE.

The test module shall cause a display to instruct the operator to exercise all the operational modes. It shall then instruct the operator to signify acceptance or rejection of each operational mode by depressing an appropriate button on the DEK. This rejection shall be used to update the status word.

The test module shall cause the display of appropriate failure messages after each separate feature of the SKE is tested.

To test the navigational fix computation capability of the SKE when used in conjunction with a zone marker (ZM), the test module shall introduce values of slant range and relative bearing to simulate the zone marker inputs. The test module shall use the Nav Brute Force SPEC for this computation.

The processing shall be performed as is specified in Figure 23.

TABLE XXXVIII      INPUTS - STATION KEEPING EQUIPMENT (SKE) TEST

DATA NAME	SYMBOL	SOURCE	REFERENCE
"STEP" COMMAND		IMK EQUIP	
TEST TASK SELECT		IMK EQUIP	
SKE INPUTS		SKE EQUIP	
TEST INITIALIZATION EVENT		TEST CONTROLLER	

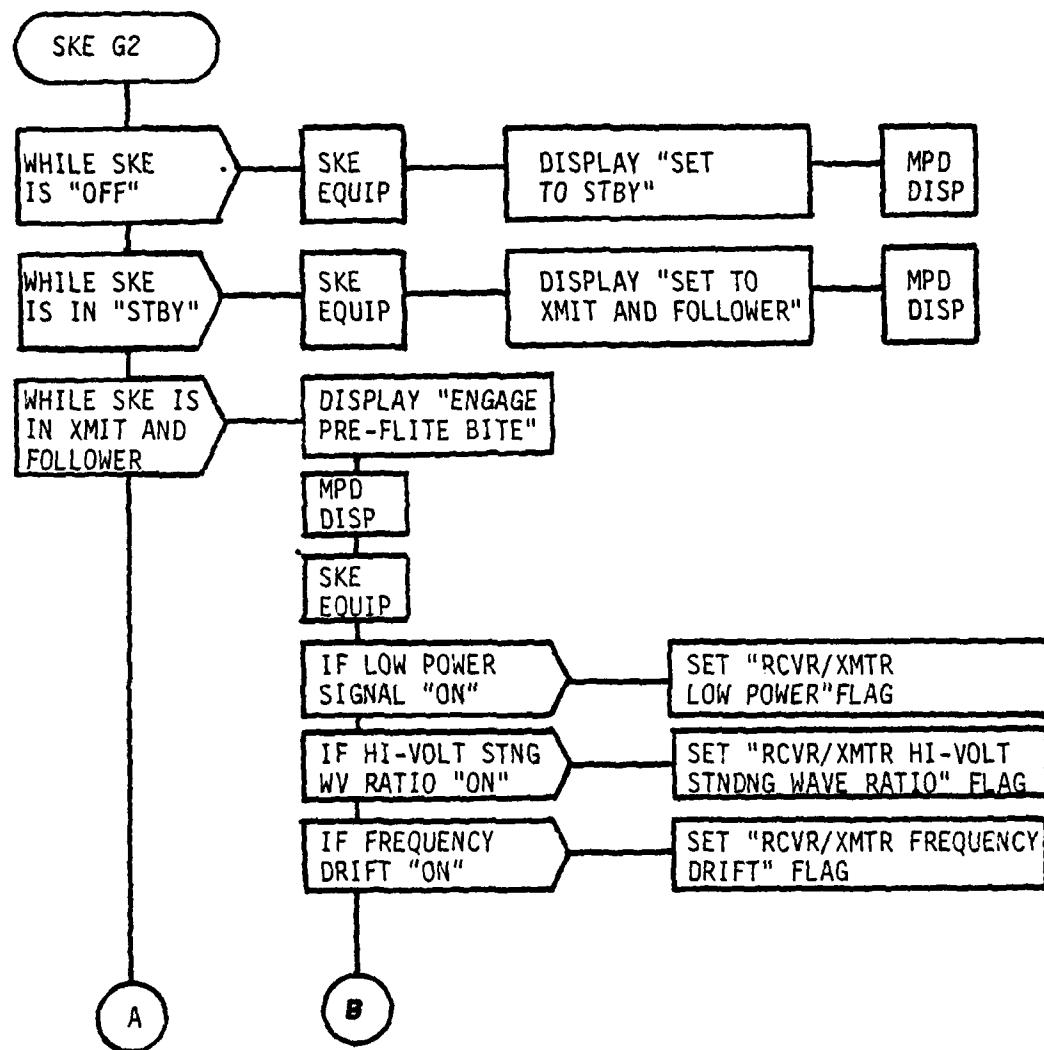


FIGURE 23

STATION KEEPING EQUIPMENT (SKE) TEST

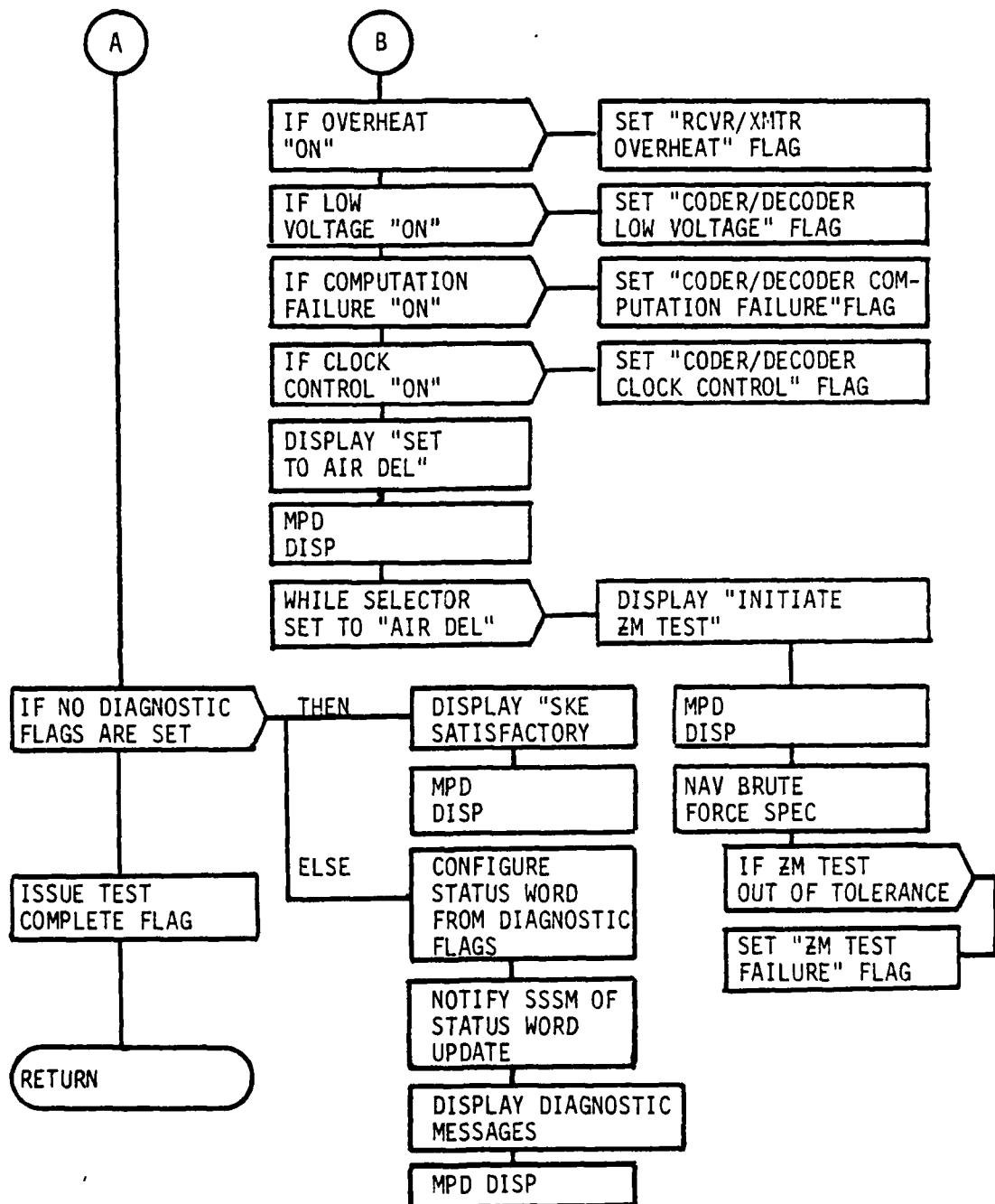


FIGURE 23 (Cont.)

STATION KEEPING EQUIPMENT (SKE) TEST

### 3.2.2.2.18.3 Outputs

The outputs from this test module shall be as specified in Table XXXIX.

### 3.2.2.2.19 OMEGA Test

This program module tests the OMEGA Navigational Equipment. This program utilizes the interface and BITE features of the OMEGA EQUIP program module. The program instructs the operator to insert the proper initialization data. It will execute a navigational fix computation based on simulated OMEGA inputs and will provide display data of the results for evaluation by the operator. It will also provide simulated inputs to the OMEGA to test the dead reckoning capability of the OMEGA, then will display data of the results for evaluation by the operator.

#### 3.2.2.2.19.1 Inputs

The inputs to this program module shall be as specified in Table XL.

#### 3.2.2.2.19.2 Processing

This test module shall call the OMEGA EQUIP program module which shall provide the software interface between the IDAMST Control/Displays and the OMEGA and shall detect and display the OMEGA BITE tests.

The test module shall provide inputs to simulate the OMEGA signals for the purpose of determining the navigation fix computation capability of the OMEGA receiver. The test module shall use the Nav Brute Force SPEC for this computation.

The test module shall provide inputs to simulate true airspeed, wind direction and velocity and compass heading for the purpose of determining the dead reckoning capability of the OMEGA computer. The test module shall also use the Nav Brute Force SPEC for this computation.

The test module shall cause a display to instruct the operator to exercise all control features of the OMEGA. It shall then instruct the

TABLE XXXIX      OUTPUTS - STATION KEEPING EQUIPMENT (SKE) TEST

DATA NAME	SYMBOL	DESTINATION	REFERENCE
STATUS WORD		SSSM	
DISPLAY MESSAGES		MPDG EQUIP	
TEST COMPLETE EVENT		TEST CONTROLLER	

TABLE XL      INPUTS - OMEGA TEST

DATA NAME	SYMBOL	SOURCE	REFERENCE
"STEP" COMMAND		IMK EQUIP	
TEST TASK SELECT		IMK EQUIP	
OMEGA INPUTS		OMEGA EQUIP	
TEST INITIALIZATION EVENT		TEST CONTROLLER	

operator to signify acceptance or rejection of each control feature by depressing an appropriate button on the DEK. This rejection shall be used to update the status word.

The test module shall cause the display of appropriate failure messages after each separate control feature of the OMEGA is tested.

The processing shall be performed as is specified in Figure 24.

#### 3.2.2.2.19.3 Outputs

The outputs from this test module shall be as specified in Table XLI.

#### 3.2.2.2.20 INS Alignment Test

This program module tests the final alignment of the Carousel IV Inertial Navigation System. This module completes the testing of the INS after the initialization begun in the Initial INS Test (see paragraph 3.2.2.2.3). This program instructs the operator to exercise the various controls and modes of operation, then provides display outputs for evaluation by the operator. It will execute navigational fix computations based on simulated inputs and will provide display data of the results for evaluation by the operator. It will check that the outputs of pitch and roll are reasonable values while the aircraft is stationary. This program utilizes the interface and BITE features of the INS EQUIP program module (OFP-Application).

#### 3.2.2.2.20.1 Inputs

The inputs to this program module shall be as specified in Table XLII.

#### 3.2.2.2.20.2 Processing

This test module shall call the INS EQUIP program module which shall provide the software interface between the IDAMST Control/Displays and

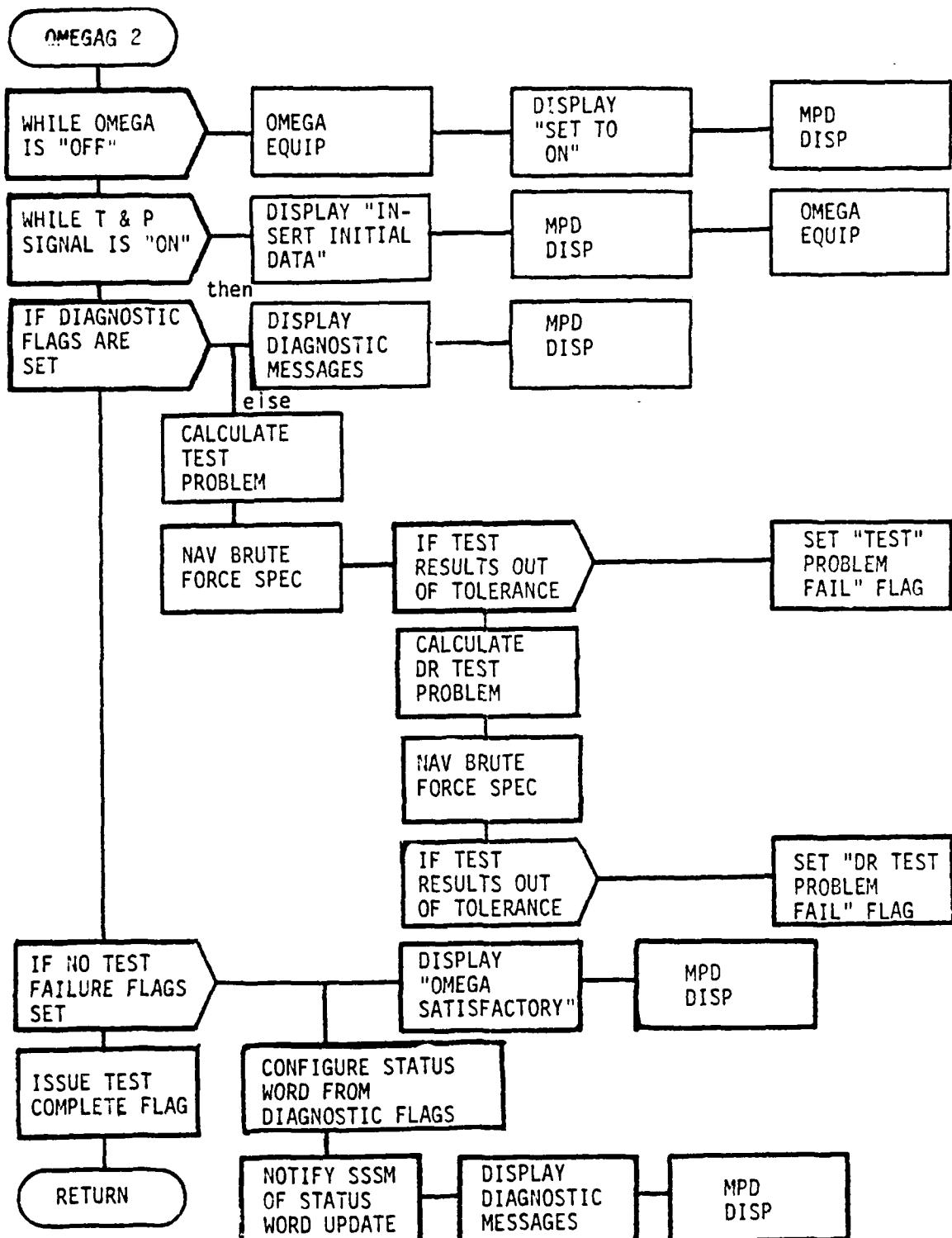


Figure 24 OMEGA Test

TABLE XLI      OUTPUTS - OMEGA TEST

DATA NAME	SYMBOL	DESTINATION	REFERENCE
STATUS WORD		SSSM	
DISPLAY MESSAGES		MPDG EQUIP	
TEST COMPLETE EVENT		TEST CONTROLLER	

TABLE XLII      INPUTS - INS ALIGNMENT TEST

DATA NAME	SYMBOL	SOURCE	REFERENCE
INS INPUTS TEST INITIALIZATION		INS EQUIP TEST CONTROLLER	

the INS and shall detect and display the INS BITE tests.

The test module shall cause a display to instruct the operator to exercise all the control features and modes of the INS. It shall then instruct the operator to signify acceptance or rejection of the operation of each control feature by depressing an appropriate button on the DEK. This rejection shall be used to update the status word.

The test module shall instruct the operator to initiate the test feature, then shall display an appropriate message describing the results of the testing.

The test module shall determine if the INS outputs of pitch and roll are reasonable values with the aircraft stationary on the ground. It shall cause the results to be displayed on the MPD. At the conclusion of the INS Alignment Test, if the results are satisfactory, the test module shall cause a display of an appropriate message signifying the acceptability of the INS. If the results are unsatisfactory, the test module shall cause the display of a message signifying the unacceptability of the INS and a display list describing the nature of the failures.

The processing shall be performed as specified in Figure 25.

#### 3.2.2.20.3 Outputs

The outputs from this test module shall be as specified in Table XLIII.

#### 3.2.2.21 IFF Transponder Test

This program module tests the IFF Transponder, AN/APX-101. This program utilizes the interface and BITE features of the IFF EQUIP program module (see OFP-Application). The program instructs the operator to exercise the various control and test modes, then provides display outputs for evaluation by the operator.

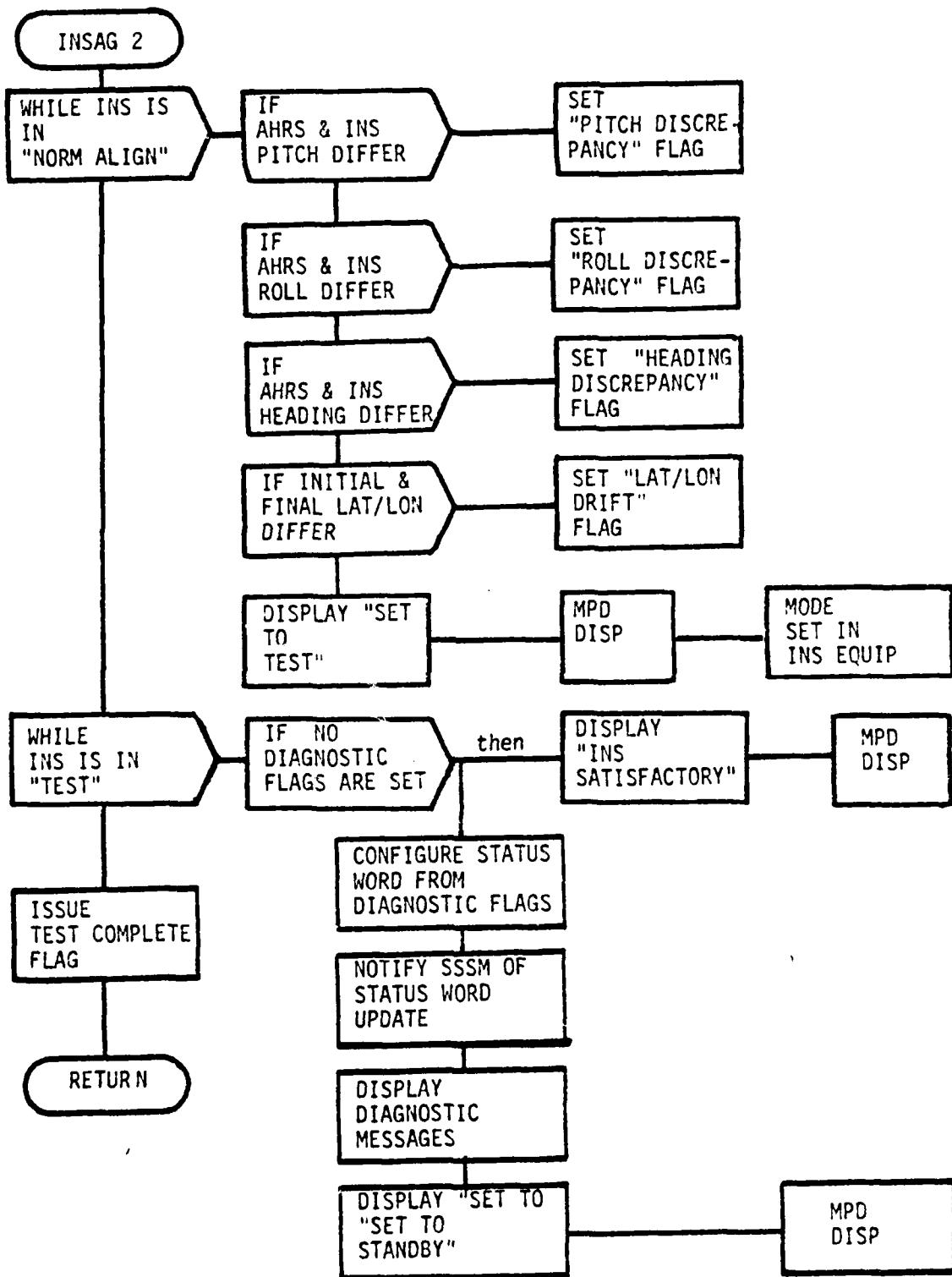


FIGURE 25 INS ALIGNMENT TEST

TABLE XLIII      OUTPUTS - INS ALIGNMENT TEST

DATA NAME	SYMBOL	DESTINATION	REFERENCE
STATUS WORD		SSSM	
DISPLAY MESSAGES		MPDG EQUIP	
TEST COMPLETE EVENT		TEST CONTROLLER	

### 3.2.2.2.21.1 Inputs

The inputs to this program module shall be as specified in Table XLIV.

### 3.2.2.2.21.2 Processing

This test module shall call the IFF EQUIP program module which shall provide the software interface between the IDAMST Control/Display and the IFF Transponder and shall detect and display the results of the IFF Transponder BITE tests.

The test module shall cause a display to instruct the operator to exercise all the operational modes. It shall then instruct the operator to signify acceptance or rejection of each operational mode by depressing an appropriate button on the DEK. This rejection shall be used to update the status word.

The test module shall cause a display to instruct the operator to activate all the mode test options, then shall instruct the operator to signify acceptance or rejection of the results by depressing an appropriate button on the DEK. This rejection shall be used to update the status word.

The test module shall cause the display of appropriate failure messages after each separate feature of the IFF Transponder is tested.

At the conclusion of the IFF Transponder test, if the results are all satisfactory, the test module shall cause the display of an appropriate message signifying the acceptability of the IFF Transponder. If the results are not all satisfactory, the test module shall cause the display of a message stating the unacceptability of the IFF Transponder and a display list describing the nature of the failure.

The processing shall be performed as is specified in Figure 26.

### 3.2.2.2.21.3 Outputs

The outputs from this test module shall be as specified in Table XLV.

TABLE XLIV      INPUTS - IFF TRANSPONDER TEST

DATA NAME	SYMBOL	SOURCE	REFERENCE
"STEP" COMMAND		IMK EQUIP	
TEST TASK SELECT		IMK EQUIP	
IFF INPUTS		IFF EQUIP	
TEST INITIALIZATION EVENT		TEST CONTROLLER	

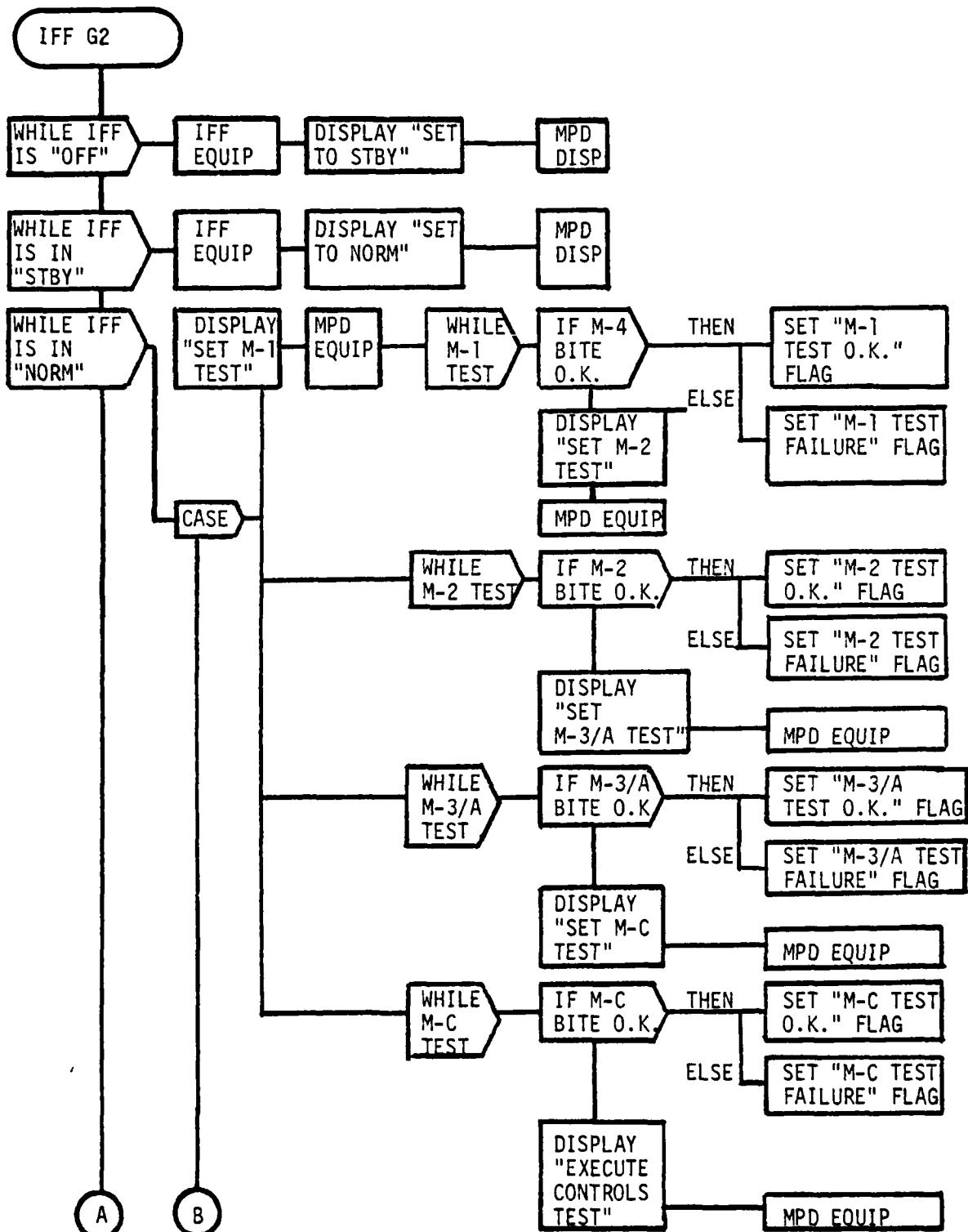


FIGURE 26

IFF TRANSPOUNDER TEST

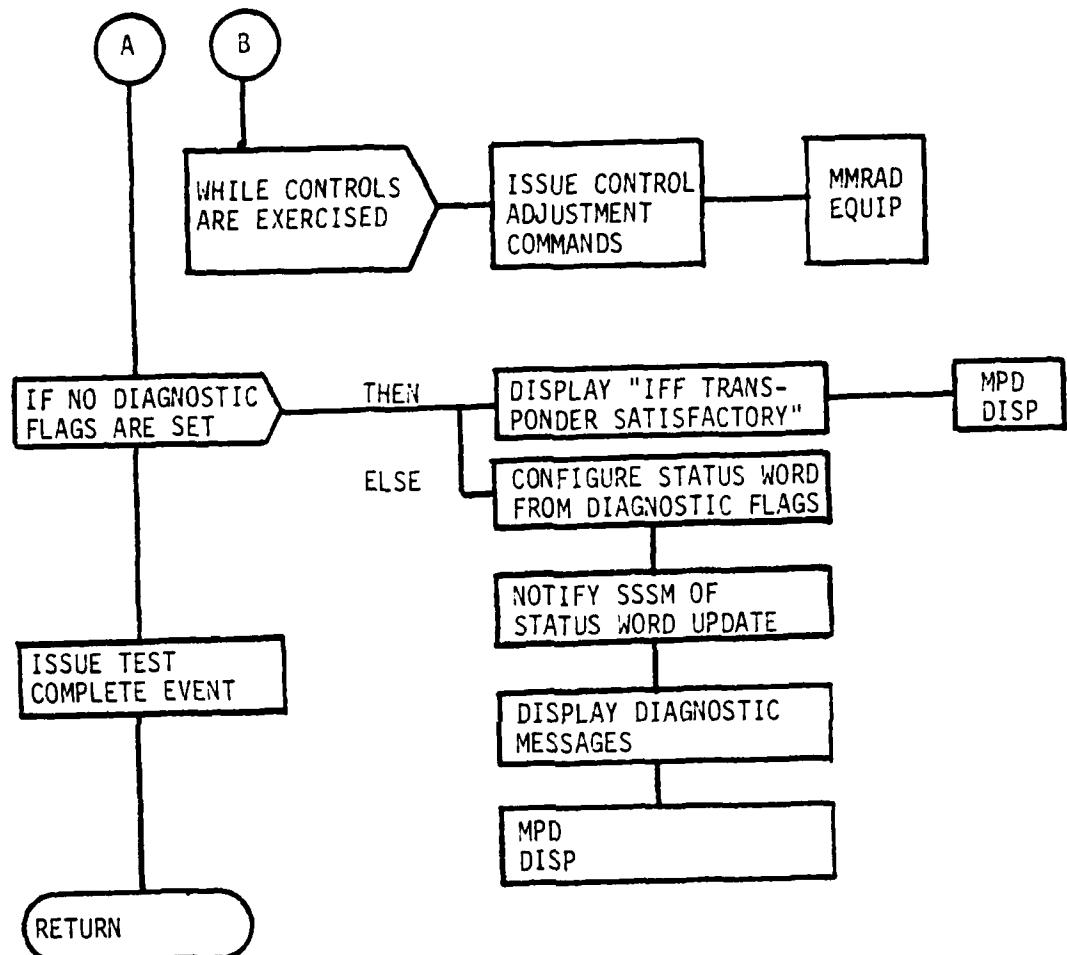


FIGURE 26 (Cont.)

IFF TRANSPOUNDER TEST

TABLE XLV                    OUTPUTS - IFF TRANSPONDER TEST

DATA NAME	SYMBOL	DESTINATION	REFERENCE
STATUS WORD		SSSM	
DISPLAY MESSAGES		MPDG EQUIP	
TEST COMPLETE EVENT		TEST CONTROLLER	

## 4.0 QUALITY ASSURANCE PROVISIONS

### 4.1 Introduction

Tests and evaluations shall be conducted to verify that the performance and design of the OTP(GTP-1,GTP-2) shall meet or exceed the requirements specified in Section 3.0. The test category, verification method, and test requirements for performance/design requirements are specified in the Verification Cross-Reference Index (VCRI), Table XLVI.

The requirements delineated shall be the basis for the test plan and test procedure which shall be written. The four methods given in Table XLVI of verifying individual requirements are explained as follows:

a. Inspection - Formal verification of a performance of a design requirement by examination of the assembled CPCl at the time and place of qualification testing. Inspection is not often specified as a formal means of verification for a requirement. One set of requirements that might be verified by inspection are the data base requirements, which can be verified by comparing the data base documentation with a system tape listing.

b. Analysis - Formal verification of a performance or design requirement by examination of the constituent elements of a CPCl component. For example, a weapons guidance equation or a coordinate conversion equation might be verified by analysis.

c. Demonstration - Formal verification of a performance or design requirement by observation of a demonstration test. For example, visual demonstration might be used to verify that the displays generated by the CPCl are in the format necessary to satisfy human performance requirements.

d. Review of Test Data - Formal verification of a performance or design requirement by examining the data output after operation of a CPCl component when selected input data are processed. For example, a review of hardcopy printout test data might be used to verify that the content of a specific told-in message is correctly processed. This method is the one likely to be used for the majority of qualification testing.

Narrative data pertaining to test categories, amplifying the tabular content of the VCRI are specified in subparagraphs below. Test requirements referenced in the VCRI are specified in paragraph 4.2 and subparagraphs thereto.

#### 4.1.1 Category I Test

Category I testing is subdivided into the following broad types:

a. Computer program test and evaluation - Tests conducted prior to and in parallel with preliminary or formal qualification tests. These tests are oriented primarily to support the design and development process.

b. Preliminary qualification tests - Formal tests oriented primarily towards verifying portions of the CPCl prior to integrated testing/formal qualification tests of the complete CPCl (see paragraph 4.1.3 below). These tests will typically be conducted at the contractor's design and development facilities.

c. Formal qualification tests - Formal tests oriented primarily towards testing of the integrated CPCl, normally using operationally configured equipment at the Category II site prior to the beginning of Category II testing. This testing will emphasize those aspects of the CPCl performance which were not verified by preliminary tests. The testing requirements which cannot be verified during Category I test shall be specified in paragraph 4.1.5.

Qualification of this CPCl shall be accomplished during qualification testing to the maximum extent possible, as a result of preliminary qualification tests (PQT) and formal qualification test (FQT) conducted by the contractor and witnessed/verified by the procuring activity.

#### 4.1.2 Computer Programming Test and Evaluation

Programming test and evaluation which apply satisfy one or both of the following criteria:

- (1) They are intended to be the only source of data to qualify specific requirements in Section 3.

(2) They must be accomplished as part of an integrated test program involving other systems/equipment/computer programs.

#### 4.1.3 Preliminary Qualification Tests

These tests will directly support the top-down implementation and verification. Method of verification shall be as specified in Table The following three levels of qualification shall be performed.

a. Unit Design Qualifications shall apply to each module. At this level the characteristics which are of primary interest are the internal workings of the module; logical flow control, numerical results, convergence, scaling, and range.

b. Module Design Qualifications shall apply to each module after it is interfaced with its environment. These tests are basically interface tests; correct internal operations are assumed. The object is to verify that two or more modules work together. To comply with the top-down approach the interfacing tests shall be sequenced from the top to the bottom.

c. System Design Qualifications shall apply to the completely assembled CPCI. This level requires a totally integrated computer program. Such testing discloses error due to conflicts introduced by data sharing convention violations, improper range of input values, sequencing requirements and communications and control. The internal working of the CPCI is of primary concern with the interfaces of the CPCI with the external environment deferred to the Formal Qualification Tests.

#### 4.1.4 Formal Qualification Tests (Specified in the Part II Specifications)

#### 4.1.5 Category II Tests (Specified in the Part II Specifications)

### 4.2 Verification Requirements

This paragraph specifies in greater detail the method used to verify the individual requirements given in Table XLVI . (This Table cross-references the sub-paragraphs of 4.2 which apply.)

TABLE XLVI

## VERIFICATION CROSS - REFERENCE INDEX

## METHOD LEGEND:

NA - Not Applicable  
 1 - Inspection  
 2 - Analysis  
 3 - Demonstration  
 4 - Review of Test Data

## TEST CATEGORY LEGEND:

A - Computer Program Test and Evaluation  
 B - Preliminary Qualification Test  
 C - Formal Qualification Test  
 II - Category II Test

SECTION 3 REQUIREMENT REFERENCE	METHOD				TEST CATEGORY				VERIFICATION REQUIREMENT	
	NA	1	2	3	4	A	B	C	II	
3.2	X									
3.2.1	X									
3.2.1.1	X									
3.2.1.1.1		X				X				4.2.3.c
3.2.1.1.2			X			X	X	X	X	4.2.2.e
										4.2.3.d
3.2.1.1.3		X				X				4.2.3.c
3.2.1.2	X									
3.2.1.2.1		X				X				4.2.3.c
3.2.1.2.2			X			X	X	X	X	4.2.2.e
										4.2.3.f
3.2.1.2.3		X				X				4.2.3.c
3.2.1.3	X									
3.2.1.3.1		X				X				4.2.3.c
3.2.1.3.2			X			X	X	X	X	4.2.2.e
										4.2.3.f
										4.2.2.a
3.2.1.3.3		X				X				4.2.3.c
3.2.1.4	X									
3.2.1.4.1		X				X				4.2.3.c
3.2.1.4.2			X			X	X	X	X	4.2.2.a
										4.2.3.g

TABLE XLVI (Continued)  
VERIFICATION CROSS REFERENCE INDEX

SECTION 3 REQUIREMENT REFERENCE	METHOD					TEST CATEGORY				VERIFICATION REQUIREMENT
	NA	1	2	3	4	A	B	C	II	
3.2.1.4.2				X		X	X	X	X	4.2.2.c
3.2.1.4.3			X			X				4.2.3.c
3.2.1.5		X								
3.2.1.5.1			X			X				4.2.3.c
3.2.1.5.2				X		X	X	X	X	4.2.2.a
										4.2.3.g
										4.2.2.c
3.2.1.5.3		X				X				4.2.3.c
3.2.1.6		X								
3.2.1.6.1			X			X				4.2.3.c
3.2.1.6.2				X		X	X	X	X	4.2.2.a
										4.2.3.g
										4.2.2.c
3.2.1.6.3		X				X				4.2.3.c
3.2.1.7		X								
3.2.1.7.1			X			X				4.2.3.c
3.2.1.7.2				X	X	X	X	X	X	4.2.2.a
										4.2.3.g
										4.2.3.f
										4.2.2.c
3.2.1.7.3		X				X				4.2.3.c
3.2.1.8		X								
3.2.1.8.1			X			X				4.2.3.c
3.2.1.8.2				X	X	X	X	X	X	4.2.2.a
										4.2.2.c
										4.2.3.f
										4.2.3.g
3.2.1.8.3		X				X				4.2.3.c

TABLE XLVI

(Continued)

## VERIFICATION CROSS REFERENCE INDEX

SECTION 3 REQUIREMENT REFERENCE	METHOD					TEST CATEGORY				VERIFICATION REQUIREMENT
	NA	1	2	3	4	A	B	C	II	
3.2.1.9	X									
3.2.1.9.1		X				X				4.2.3.c
3.2.1.9.2				X		X	X	X	X	4.2.2.a
										4.2.2.c
										4.2.3.f
3.2.1.9.3										4.2.3.c
3.2.1.10	X									
3.2.1.10.1		X				X				4.2.3.c
3.2.1.10.2				X		X	X	X	X	4.2.2.a
										4.2.2.c
3.2.1.10.3										4.2.3.c

#### 4.2.1 Performance

The specified function shall be verified with respect to one of the following performance criteria.

- a. Accuracy which may be affected by input precision, input frequency, input accuracy, or number of iterations
- b. Execution time
- c. Storage used
- d. Response time
- e. Long term degradation
- f. Stability

#### 4.2.2 Priority/Timing

The specified function shall be verified with respect to one of the following priority/timing criteria.

- a. Interrupt and return
- b. Frequency
- c. Consistency in events
- d. Order of processing
- e. Scheduling/cancelling consistency
- f. Job stacking

#### 4.2.3 Interfaces

The specified function shall be verified with respect to one of the following interface parameters.

- a. Data locks
- b. Range
- c. Consistency
- d. Initialization

- e. Data organization
- f. Human command/response
- g. External procedures

#### 4.2.4 Logic Paths

The specified function shall be verified with respect to the correctness of the logic paths by exercising the computer program in operation.

#### 4.2.5 Off-Nominal Condition

The specified function shall be verified with respect to off-nominal conditions such as:

- a. Error detection
- b. Error recovery
- c. Limitations